

# The mining industry of Zambia

By Paul Jourdan

**In terms of value the Zambian minerals industry is the second largest in the SADCC, but it is virtually all copper and its byproduct cobalt. From independence in 1964, the government made some progress in the diversification of the economy by expanding the manufacturing industry, but this was in turn dependent on copper earnings for the import of inputs. At the same time there was a stagnation and then a decline of the agricultural sector. The main difficulty presently facing Zambian planners is the constantly declining real value of the principal export product, copper.**

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## A brief history of mining in Zambia

Ferrous and non-ferrous metallurgy was brought to Zambia by the Bantu speaking peoples in about 500 AD. Copper was mined and smelted in numerous locations as is borne out by the many ancient workings on oxidized deposits particularly in the Katanga (Shaba) area. There are fewer ancient workings on the Zambian side of the Copperbelt as most of the outcrops were leached of copper. Kanshansi and Bwana Mkubwa had important ancient workings on oxide (usually malachite) deposits.<sup>1</sup>

By the 16th Century copper was being extensively traded as ingots in the form of a St Andrews Cross. First written reference to mining on the Copperbelt was in 1591 by Filippo Pigafetta in Rome based on information from a Portuguese traveller, Odoardo Lopez<sup>2</sup>. The ingots were traded via the Arabs on the east coast who had trading outposts as far down as Sofala (Beira). This lucrative trade in copper, gold, ivory and slaves was later taken over by the Portuguese.

When the first Europeans arrived in the area at the end of the last Century copper mining had almost ceased except for a few workings in Katanga. It is estimated that over 100 kt of copper from 1 Mt of ore was produced from the ancient Katanga workings. The ancient mines were limited by the water table and because sulphide ores could not be smelted.<sup>3</sup>

Following the gold and diamond rushes in the 1880s in South Africa, the principal mining magnate, Cecil John Rhodes, started looking north for further mineral deposits to finance his dream of a Cape to Cairo railway. To this end he obtained a charter from the British Government for the *British South Africa Company* (BSAC) to penetrate the interior.

In 1885 the border between the British and Belgian spheres of influence had been defined as the watershed between the Congo and Zambezi River basins,

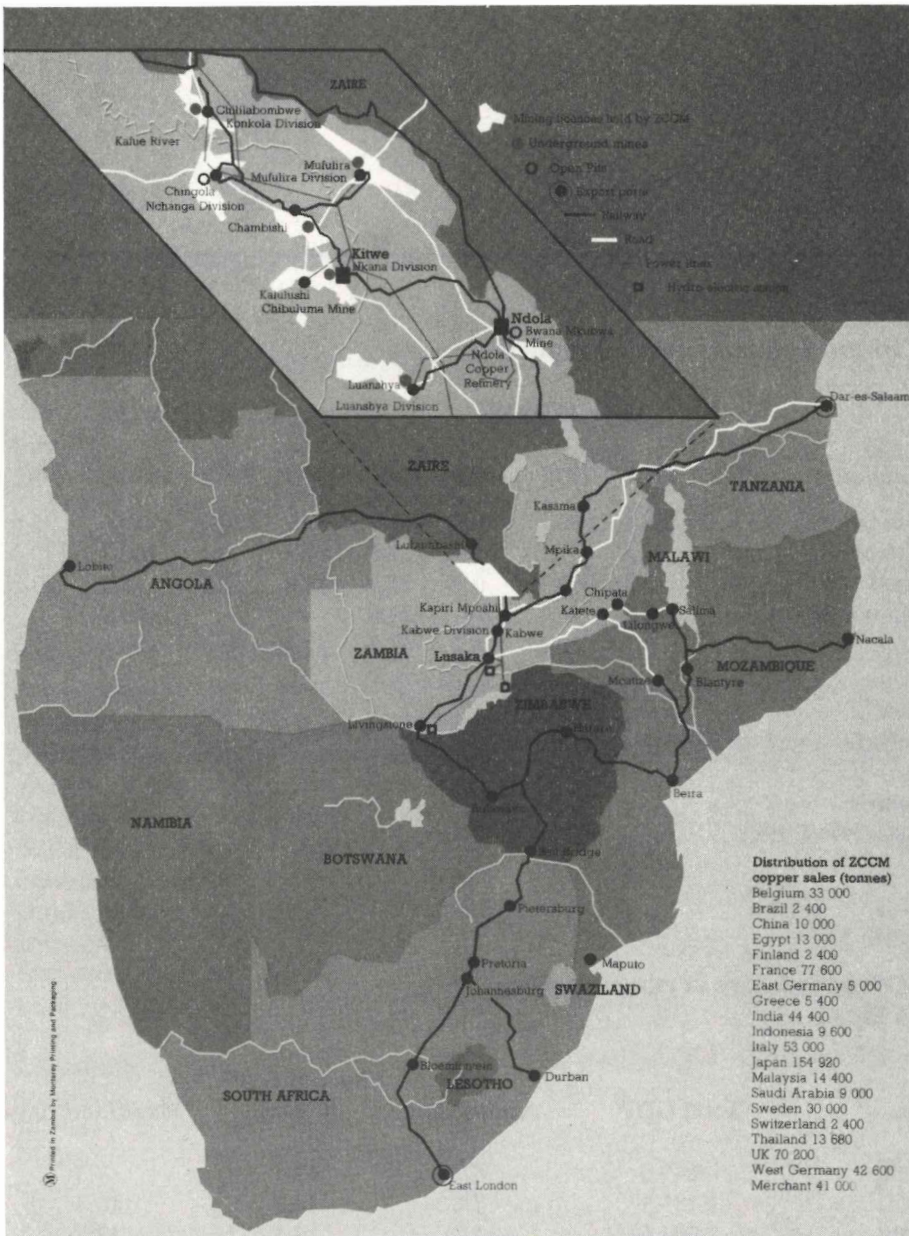
which runs through the middle of the Copperbelt. In the same year the BSAC obtained exclusive rights to minerals in the Rhodesias from Queen Victoria, valid until 1986.

Mining operations started on the Katangan side of the border in 1910 and in 1908 Zambia's first commercial production started at Kanshansi, in 1911 at Sable Antelope. In 1913 Bwana Mkubwa produced its first concentrate. Further south at Kabwe, mining started on a lead/zinc deposit in 1905. In 1906 the railway reached this mine and concentrates were exported to Britain.

In 1922 the BSAC decided to grant exclusive prospecting rights over vast areas to large mining companies to undertake systematic exploration and in 1923 Copper Ventures Ltd obtained a concession along the Katanga border. In the same year the Nkana sulphide deposit was discovered and by the late twenties development work was underway on several of the Copperbelt deposits. *Rhodesian Selection Trust* (RST) was formed in 1928 with British and American capital. RST later became *Roan Consolidated Mines* (RCM) with a 20 per cent shareholding by the American Metals Company which later became AMAX Inc. *Nchanga Copper Mines* (NCM) was formed in 1926 as a subsidiary of the Anglo American Corporation of South Africa. RST and the AAC controlled Zambian copper mining via their subsidiaries RCM and NCM for the next 40 years.

With the onset of the depression in 1929 copper mining and prospecting virtually ceased. In 1931 the companies agreed to cut production by 75 per cent in an attempt to face the crisis and several mines were closed during this period. By 1935 copper prices had rallied and 146 kt of copper were produced. The build-up to and outbreak of World War II rapidly increased demand for copper and by 1940 production had reached 265 kt.

Zambia gained independence from Britain in 1964 and it was only a few



thereby increasing its shareholding to 60 per cent and 61 per cent respectively. In 1982 NCCM and RCM were merged to form *Zambia Consolidated Copper Mines Ltd. (ZCCM)* in which the state's holding is 60.3 per cent via ZIMCO.<sup>4</sup>

### Background

Zambia covers 753 000 km<sup>2</sup> and has a population of 6 million resulting in a low density of only 8 persons per km<sup>2</sup>. In 1983 it had a GDP/capita of about 580 USD<sup>5</sup>. The economy is heavily dependent on the mining industry. Although its contribution to GDP has decreased from 42 per cent in 1965 to 14 per cent in 1984 it still generates 93 per cent of exports (Tables 1—3).

Declining copper prices over the last five years have put severe strains on the economy. In real terms the price of copper has fallen 60 per cent since 1970 and 41 per cent since 1960. Zambia's real earnings from copper have fallen 65 per cent since its independence (1964) and 69 per cent since 1970.

From these data it is apparent that the Zambian economy is now having to operate on about 35 per cent of the foreign exchange (forex) that it had in 1970. In an attempt to counter the effects of declining terms of trade the local currency has been drastically devalued

hours before independence that the state managed to acquire the mineral rights to the country from the BSAC, for 4 M GBP. But the BSAC had previously granted mining concessions in the best areas to RCM and NCM in perpetuity.

In 1970 the mines were nationalized and the companies were reorganized into *Nchanga Consolidated Copper Mines (NCCM)* and *Roan Consolidated Mines (RCM)* with 51 per cent of the shares being held by the wholly state-owned *Zambia Mining and Industrial Corporation Ltd (ZIMCO)* which issued bonds worth 331 M USD at 6 per cent to the old owners for the 51 per cent holding. The minority 49 per cent of NCCM was held by *Zambia Copper In-*

*vestments (ZCI)*, owned by Minorco in Bermuda which is in turn owned by AAC and De Beers of South Africa. The 49 per cent of RCM was held by RST International Inc, a subsidiary of AMAX Inc.

In 1974 and 1975 the management agreements with AAC and AMAX were terminated and the state bought the issued bonds. NCCM and RCM were established as self-managing companies with Zambian managing directors. At the same time a subsidiary of ZIMCO was created, the *Metal Marketing Corporation of Zambia (Memaco)* to market all minerals produced in Zambia.

In 1979 the state converted part of its loans to NCCM and RCM into equity,

**Table 1**

**Zambia: National dependence on minerals**

Year	%		
	total exports	State revenue	GDP
1964	93.2	53	38
1970	98.4	57	36
1975	96.9	13	13
1980	96.4	6	16
1983	95.5	4	11

**Sources:**

CSO, 1970 & 1985; CISB, 1975 & 1981.

since 1982 when the Zambian Kwacha (ZMK) was worth about one USD. By August 1985 there were 2.3 ZMK to the USD and at the end of 1985 forex auctioning was introduced at the behest of the IMF and the currency dropped to 6.5 ZMK to the USD. This represents an 85 per cent devaluation against the USD since 1982 which has resulted in massive price hikes for basic commodities causing high inflation and significant erosion of salaries and wages in the formal sector.

Since the onset of the decline in mineral export earnings Zambia's foreign indebtedness has increased considerably. Table 4 displays the increasing debt burden as well inflation (wholesale price index). Foreign disbursed debt in USD increased 460 per cent between 1970 and 1984 while debt servicing as a percentage of total exports increased 470 per cent over the same period. The buying power of the Kwacha decreased by 80 per cent from 1970 to 1984.

Several other minerals are produced in Zambia, the principal ones being cobalt (a by-product of copper mining), lead, zinc and coal. Production data for all minerals for the years 1973, 1980 and 1983 is presented in Table 5. From the table it is apparent that the Zambian mining industry is dominated by non-ferrous metals. In 1983 together they constituted 93 per cent of the total value of mineral production and copper alone accounted for 86 per cent.

The only major non-ferrous minerals are cobalt and coal, but both are to some degree dependent on the non-ferrous mineral industry, the one as a by-product and the other as fuel for smelting. Limestone and pyrites are also mined as inputs for copper processing.

Other by-products of non-ferrous mining are gold (316 kg in 1983), selenium (18 t in 1983) and silver (29 t in 1983). Manganese ore was produced until 1968 at the rate of roughly 50 kt per annum.

**Table 2**  
**Zambia: Principle mineral exports**

Mineral	Rank	Value M ZMK			Volume (kt)			% chg 64—83	% prod 1983
		1983	1964	1975	1983	1964	1975		
Copper	1	296.8	597.7	930.3	681.0	589.2	550.6	-19.1	95.6
Cobalt	3	3.5	7.1	28.8	1.5	1.3	3.1	106.7	130.0
Lead	4	2.3	5.7	6.9	13.4	19.4	12.3	-8.2	83.2
Manganese	—	0.6	—	—	27.0	—	—	-100.0	—
Zinc	2	9.7	20.4	34.7	45.9	41.3	36.9	-19.6	97.5

**Note:**  
Refer to Table 5 for footnotes.

**Source:**  
CSO, 1974 & 1985.

**Table 3**  
**GDP by industry at current prices**  
**(M ZMK)**

Year	Total GDP	Share of GDP (%)		
		Agriculture	Mining	Manufacturing
1965	649.9	8.2	42.3	7.3
1970	1 185.3	7.2	36.8	10.4
1980	3 063.6	14.2	16.5	18.5
1984	4 733.3	14.7	14.0	20.9

**Source:**  
CSO, 1974 and 1985.

**Table 4**  
**Foreign debt and index of wholesale prices**

Year	Foreign debt		Debt service % of exports	Wholesale price index
	G USD	% GNP		
1970	0.63	37	5.9	100
1982	2.38	66	17.4	320
1983	2.64	84	12.6	397
1984	2.90	136	27.7	508

**Source:**  
World Bank, 1985; CSO, 1985; Bank of Zambia, 1985.

**Table 5**

**Zambia: Mineral production 1973, 1980, 1983**

Mineral	Unit	Rank 1983 <sup>a</sup>	Value k ZMK			% 1983 <sup>b</sup>	Volume			% chg 73—83 <sup>c</sup>
			1973	1980	1983		1973	1980	1983	
Amethyst	t	9	718.0	67.2	7 777.9	0.63	79.0	3.4	38.8	-50.9
Cadmium	t	—	77.6	7.6	.0	.0	14.8	1.4	.0	-100.0
Calcite	t	15	.0	.0	316.0	0.03	.0	.0	2.0	—
Cement	kt	5	.0	8 024.1	15 910.8	1.30	.0	160.4	155.0	—
Coal	kt	4	8 703.3	16 343.9	17 411.2	1.42	940.0	568.8	452.9	-51.8
Cobalt	t	3	8 109.2	141 647.8	34 930.8	2.85	1 930.0	3 310.0	2 407.0	24.7
Copper total	kt	1	740 196.9	601 605.4	1 060 589.8	86.45	682.8	599.6	575.4	
blister <sup>d</sup>	kt	—	44 309.6	25 305.1	.0	0	43.4	26.2	0	-100.0
electrolytic	kt	1	694 756.1	576 300.3	1 060 589.8	86.45	638.4	573.4	575.4	-9.9
other	kt	—	1 131.2	0	0	0	1.0	0	0	-100.0
Emeralds		(2) <sup>f</sup>								
Feldspar	t	20	1.0	78.9	32.3	0.00	12.0	789.0	226.0	1 783.3
Fluorite	t	—	0.6	46.2	0	0	7.0	420.0	0	-100.0
Gold	kg	11	597.2	5 658.3	5 955.2	0.49	246.8	329.0	315.8	28.0
Gypsum	t	—	6.7	0	0	0	480.0	0	0	-100.0
Iron ore	kt	—	0	25.1	0	0	0	4.2	0	—
Lead	kt	10	5 718.9	6 096.2	6 241.3	0.51	25.0	10.1	14.6	-41.6
Lime	kt	7	0	9 465.9	12 837.0	1.05	0	182.2	193.1	—
Limestone	kt	12	4 718.8	2 098.0	2 830.0	0.23	977.8	515.4	510.6	-47.8
Magnetite	t	19	0	60.5	97.9	0.01	0	378.0	612.0	—
Phyllite	kt	21	8.6	3.7	4.9	0.00	66.6	1.7	9.9	-85.1
Pyrites <sup>e</sup>	kt	13	1 690.3	375.5	1 097.1	0.09	30.7	1.1	25.5	-16.9
Selenium	t	17	250.5	380.3	209.4	0.02	20.2	22.7	18.3	-9.4
Silicate	kt	14	0	248.1	375.9	0.03	0	8.3	9.4	—
Silver	t	6	1 594.6	14 322.0	14 590.4	1.19	15.8	23.8	29.0	83.5
Talc	kt	16	113.6	0	262.7	0.02	1.3	0	1.3	—
Tin conc	t	18	11.3	1.5	148.6	0.01	7.5	0.2	21.7	189.3
Tourmaline	kg	8	0	0	8 974.4	0.73	0	0	452.0	—
Zinc	kt	2	16 055.4	16 627.5	36 238.0	2.95	55.4	32.7	37.9	-31.6
<b>Total</b>			<b>788 572.5</b>	<b>1 193 930.2</b>	<b>1 226 831.7</b>	<b>100</b>	<b>nap</b>	<b>nap</b>	<b>nap</b>	<b>nap</b>

**Notes:**

<sup>a</sup> rank by value in 1983.

<sup>b</sup> % of total mineral production in 1983.

<sup>c</sup> % change from 1973 to 1983.

<sup>d</sup> includes anode copper.

<sup>e</sup> in terms of contained sulphur.

<sup>f</sup> large scale emerald smuggling (possibly 50 ZMK).

**Source:**

SADCC, 1985.

## Mining and the economy

Zambia is highly dependent on mining, (copper and its byproduct cobalt, lead and zinc) to the extent that it is virtually a mono-mineral economy (copper). The contribution of the metals mining sector to GDP has fallen from 38 per cent in 1964 to 14 per cent in 1984 while as a percentage of government revenue it has declined drastically from 53 per cent at independence to 6 per cent in 1984. Its proportion of total formal employment has remained fairly constant at around 15 per cent (Table 6).

In 1984 copper exports generated 87 per cent of forex and over the twenty years 1964 to 1984 it averaged 91 per cent of exports. Over the same period zinc averaged 2.6 per cent and lead 0.7 per cent of exports giving a total average for non-ferrous metals of 94 per cent.

Copper exports peaked in 1976 at 745.7 kt then steadily fell to 530.3 kt in 1984. Zinc and lead exports both peaked in 1972 at 60.6 and 26.7 kt respectively. By 1984 zinc exports had fallen 47 per cent to 32.1 kt and lead exports had dropped 68 per cent to 8.5 kt.

Zambia's share of world copper output has fallen steadily since 1960, from 13.6 per cent to 6.4 per cent. It was never a world league producer of either zinc or lead and its percentage of world output of both these metals has fallen by over 50 per cent in the last 25 years, from 1.0 per cent to 0.4 per cent for zinc and 0.7 per cent to 0.3 per cent for lead.

All the non-ferrous metals are processed to their pure form before export onto the world market. Further transformation beyond refining is minimal. About 2 per cent of copper production is transformed into rod before export and less than 1 per cent is used by the local market mainly in the form of wire and cable. Roughly 25 per cent of lead and 2 per cent of zinc production is consumed in the country.

A small quantity of tin is mined in the Tin Belt of southern Zambia from pegmatites and related alluvial placers. Re-

serves are estimated at 215 tons of cassiterite in widely scattered small deposits. It has been mined since 1935 and in 1983 production was 22 tons of cassiterite concentrate. Non-ferrous Metal Works Ltd in Ndola produces a small amount of low grade tin metal for the manufacture of solder, but the quality is not high enough for tin plating.

Coal is mined in the Zambezi Valley by Maamba Collieries Ltd, a wholly-owned subsidiary of ZIMCO. Mining started in 1966, peaked at 940 kt in 1973 then steadily declined to 483 kt in the 1983/4 financial year, due to deterioration of plant and machinery. A rehabilitation program of the mine is underway.

### Zambia Consolidated Copper Mines (ZCCM)

ZCCM accounts for all of Zambia's copper, cobalt, lead, zinc and pyrites production. The company is 60 per cent state owned via the state holding com-

pany *Zambia Mining and Industrial Corporation (ZIMCO)*. The only significant minority shareholding is 27 per cent held by Zambia Copper Investment Ltd, which is owned by Anglo American and De Beers of South Africa via their subsidiary Minorco in Bermuda.

In 1982 Nchanga Consolidated Copper Mines and Roan Consolidated Mines were merged to form ZCCM. RCM and NCCM had been the major companies from the beginning of large scale copper mining in the early 1930s. Table 7 gives a financial summary of the company for the years 1971 to 1985.

In January 1986 the company announced a "survival plan" which entailed the closure of Kansanshi mine, Chambishi mine, number 3 shaft at Konkola, the Luanshya smelter, the Ndola refinery tank-house and two concentrators. These closures will result in the laying-off of about 3 000 workers.

This plan arises out of the results of two studies done by outside consultants

**Table 6**  
**Metals mining<sup>1</sup>. Contribution to GDP, revenue and employment (in %)**

Year	Contribution to GDP	Contribution to Govt revenue	Contribution to employment
1964	38	53	18
1966	44	64	16
1968	38	60	15
1970	36	57	14
1972	24	22	14
1974	32	53	15
1976	18	3	15
1978	12	—	15
1980	16	5	15
1982	11	—	16e
1984	14	6	15e

#### Notes:

<sup>1</sup> Copper, cobalt, lead, zinc and precious metals.  
e = estimate.

#### Sources:

CSO, 1985; CISB, 1970—80.



in 1985 on ZCCM. According to these studies ZCCM is a viable enterprise if it is allocated the foreign exchange it requires to operate. Since the late seventies the company has not been able to get the necessary foreign currency to operate efficiently, resulting in the deterioration of plant and machinery and higher operating costs. The government is unable to give the company the foreign exchange that it needs (about 40 per cent of earnings) due to the requirements of the rest of the economy. At present the company requires about 350 M USD in hard currency to operate efficiently, about one-third of which is for servicing the company's foreign denominated debt. It therefore appears that the company has decided to drop the more costly operations and to concentrate its limited forex on the most viable operations in order to bring itself back to profitability. In this manner overall output will remain constant by increasing the production of the remaining operations.

In general about 30 Mt of ore grading on average about 2.2 per cent copper are mined annually from both open pit and underground operations.

The average grade treated has been steadily falling from 2.65 per cent in 1972 to 2.15 per cent in 1984, representing a drop of 19 per cent over 13 years. The gross tonnage of ore milled has also been falling, by 11 per cent over the same period.

In 1984 ZCCM had seven operating divisions, namely Nkana, Nchanga, Mufuilira, Luanshya, Chambishi, Konkola and Kabwe. In April 1985 Kalulushi Division was dissolved and its mines were incorporated into Nkana and Nchanga divisions. There was further restructuring in April 1986 into five divisions, namely Nchanga (Nchanga, Konkola and Chambishi mine), Nkana (Nkana, Chibuluma and Chambishi cobalt and acid plants), Luanshya (Luanshya and Baluba), Mufuilira and Kabwe (Kabwe and Nampundwe).

**Table 7**

**ZCCM: Financial profile**  
(constant 1981 M USD)

Year	Gross sales	Capital empl	Profit (pre tax)	Tax <sup>1</sup>	Dividend	Debt <sup>2</sup>	Interest paym	Cost/lb Cu <sup>3</sup>
1971	935	757	404	200	102	50	1	84
1972	755	882	224	60	80	111	3	84
1973	936	1 095	285	81	105	153	9	78
1974	1 493	1 217	775	477	172	183	11	71
1975	1 161	1 497	277	136	37	285	12	77
1976	859	1 750	(90)	(84)	0	360	39	81
1977	1 028	1 511	83	54	0	314	42	67
1978	808	1 296	(75)	(48)	0	244	40	60
1979	1 116	1 688	126	13	6	267	48	61
1980	1 329	1 715	284	112	29	234	39	68
1981	1 312	1 852	42	(26)	11	337	50	83
1982	1 061	1 714	(186)	3	0	502	72	85
1983 <sup>4</sup>	767	1 332	(97)	4	0	465	47	68
1984	803	1 057	55	54	0	442	64	66
1985	711	1 549	55	55	0	467	56	61

**Notes:**

<sup>1</sup> Tax paid or recovered.

<sup>2</sup> Long-term debt.

<sup>3</sup> US cents per lb Cu.

<sup>4</sup> For 1971—82 the USD Manufacturing Unit Value Index deflator was used and from 1983—85 the US GNP deflator was used.

**Source:**

*Radetzki*, 1985 (for 1971—82); ZCCM, 1985 (for 1983—85).

**Table 8**

**ZCCM: Copper reserves<sup>1</sup>**

Mine	1975-03-31			1985-03-31			% Change <sup>3</sup>
	Ore Mt	Grade % Cu	Grade % Co	Ore Mt	Grade % Cu	Grade % Co	
Nchanga	252.3 <sup>2</sup>	3.42	na	91.7	3.92	0.77	<sup>4</sup>
Mufuilira	143.9	3.15		86.8	3.05		-42
Nkana	119.9 <sup>2</sup>	2.44	na	81.7	2.38	0.14	<sup>4</sup>
Luanshya	72.1	2.56		41.9	2.42		-45
Baluba	64.4	2.62	0.16	50.3	2.56	0.16	-24
Chibuluma	8.4	4.58		8.8	3.35	0.23	-23
Chambishi	42.3	2.91		23.6	2.79		-47
Konkola	125.1 <sup>2</sup>	3.55	na	51.8	3.82	0.07	<sup>4</sup>
Kansanshi	nap	nap		4.0	2.84		nap

**Notes:**

<sup>1</sup> Total reserves.

<sup>2</sup> As at 1974-12-31.

<sup>3</sup> Ore x grade.

<sup>4</sup> The old NCCM definition of reserves is different to the current ZCCM one.

**Source:**

NCCM, 1975; RCM, 1975; ZCCM, 1985.

## Marketing

Since 1975, all metals marketing has been carried out by the parastatal, *Metal Marketing Corporation of Zambia Limited* (MEMACO), a subsidiary of ZIMCO. In 1984/85 MEMACO sold 1,79 G ZMK of metals from which it earned 17 M ZMK from commissions and made an after tax profit of 5.3 M ZMK.

MEMACO has two subsidiaries in London, MEMACO Services Ltd and MEMACO Trading Ltd, which deal with their trading in Europe. The transportation of metals is carried out by the ZCCM subsidiary Zamcargo Ltd.

Zambia, as a land-locked country, regularly has problems in transporting its minerals to ports for shipment overseas. The western route along the Benguela Railway to Lobito Bay in Angola has been out of action since 1975 due to South African sabotage and sabotage by the RSA and USA backed UNITA bandits. Since 1974 the new Tazara Railway to Dar es Salaam has been used, but this line has had major maintenance problems over the last few years so that the southern route through the RSA to the port of East London has increasingly been used. A small amount of metal is also transported to Dar es Salaam by road by the *Zambia Tanzania Road Services* (ZTRS), but at a very high cost. It generally takes about three months for the copper to travel from the refinery to the warehouses in Europe.

In 1984/85 of all metals despatched 79.3 per cent went via Dar es Salaam. 99.2 per cent by rail and 0.8 per cent by road, and 20.7 per cent went via East London. Consumers in southern Africa accounted for 1.4 per cent of the total tonnage sold. The high value metals are airfreighted (gold and silver).

The majority of MEMACO's sales are for copper which is traded at the LME price plus the high grade premium (about 45 GBP). In 1984/85 sales were 570.1 kt of copper made up of 393.4 kt of refined cathodes, 93.6 kt of wirebars, 38.7 kt of electrowon cathodes and 0.2

kt of billets. Wirebar production and sales has been on the decline due to a decrease in the demand for this form. The principal markets in 1984/85 for Zambian copper were (in per cent):



About 9 per cent of sales went to merchants. The ZCCM owns 50 per cent of a copper rod (CCR) manufacturing company, *Société de Coulée Continue de Cuivre* (SCCC), in France which sold 164 kt of wirerod in 1984.

In 1984/85 3 501 t of cobalt were sold, 48.6 per cent to the USA and 40.7 per cent was sold to merchants. The other major markets were the UK at 7.8 per cent and West Germany at 3.3 per cent. Two-thirds of the sales to the USA were to the *General Services Administration* (GSA) for their strategic stockpile. Most cobalt ends up as in special steels so that cobalt prices are highly dependent on the state of the western countries' steel industries which showed some recovery in 1984 after several years of little or no growth.

Most lead sales are local and within the region (82 per cent). In 1984/85 13 345 tons were sold of which 19.3 per cent went to Zambian customers, 44 per cent to the RSA, 18.7 per cent to Zimbabwe, 17.2 per cent to India and Tanzania took 110 t (0.8 per cent). Due to a shortfall in production not all of the southern African orders could be met.

Zinc sales in 1984/85 were 30.3 kt made up of 20.4 kt of Sable 2 (high grade, 99.95 per cent Zn) and 9.9 kt of Sable 4 (98.5 per cent Zn). The main customers were India at 28.4 per cent, the UK at 23.2 per cent, East Africa at 23.0 per cent, Greece at 11.9 per cent and Egypt at 9.9 per cent. Zimbabwe and the RSA together took 2.5 kt (8.2 per cent) and local sales in Zambia accounted for 998 t (3.3 per cent).

MEMACO appears to be an efficient and experienced trader of copper on the world markets. It has managed to build up an experienced core of personnel in the difficult field of metals trading who have over the years acquired the confidence of several international customers for the Zambian high grade product. They have a major disadvantage with regard to their competitors due to their long delivery times (about 3 months to Europe) but they appear to have overcome this via copper exchanges (100 kt in 1984/85) to facilitate timely deliveries.<sup>6</sup> Given their experience and overseas infrastructure they could save the other (small) copper producers in the region much needed forex if they were to market their production for them.

Zambia is a member of CIPEC but this body has never been an effective producer organization in terms of stemming the declining price of copper. The recent demise of the last effective metal producer body, the ITC, does not augur well for the establishment of CIPEC as an active producer organization.

## Labour

Non-ferrous metals account for 97 per cent of the total mining industry workforce and copper mining alone makes up 93 per cent. The non-ferrous expatriate labour force was 16 per cent of the total in 1964 then steadily declined to 3.1 per cent in 1984 (Table 9) and has further declined since then. This reduction has come about principally due to a rapid increase in mining company in-house training programmes since independence. In 1985 there were 105 Zambians on training programmes overseas sponsored by ZCCM. The creation of the School of Mines at the University of Zambia in 1971 has also increased the number of Zambian professionals in the mining industry.

In 1983 the average earnings in the mining industry were 4 129 ZMK per year, 43 per cent more than for industry as a whole. Within the mining industry the ratio of Zambian to expatriate earn-

ings was 1:2.7, compared to 1:4.7 in 1970, mainly due to a significant increase of Zambians in professional and managerial positions.

From 1970 to 1983 average annual earnings of Zambian miners increased by 269 per cent in current terms but as inflation was about 410 per cent over the same period, earnings fell by 45 per cent in real terms. Since then wage increases have lagged well behind inflation so that in real terms earnings have fallen substantially<sup>7</sup>, especially since forex auctioning was introduced at the end of

1985 which provoked a massive devaluation of the currency and runaway inflation.

#### Safety

Fatalities per thousand workers fell steadily from 1956 to 1974 by 50 per cent, but since then have remained fairly static at around 1 death per 2 000 workers (Table 10). Serious injuries per thousand workers dropped by 47 per cent from 1964 to 1982. From 1982 the rate has remained constant at about 32 per 1 000 workers.

The two principal causes of fatalities were the handling of equipment and rock falls in both 1984 and 1985. The company has accidents prevention officers for each division and the divisional safety committees have a union representative on them.

#### Unions

The first miners strikes took place in 1935 in response to a unilateral increase in taxation by the colonial government and was not broken before six miners had been killed. In 1937 a white miners union was formed to attempt to maintain white privileges and to stem the advancement of the black workers into "white" jobs.

The first African trade union was formed in 1948 and by 1949 the *Northern Rhodesia African Mineworkers Trade Union* had branches across the Copperbelt. Its main focus was on removing the racist job barriers which were supported by the white union and instituting a non-racial system of equal pay for equal work. In 1955 the African union went on strike on the issue of wage increases and the demand for a closed shop. The turnout was virtually 100 per cent and the strike lasted 58 days before the companies agreed to their demands.

The racist job barriers were only dismantled in 1963 a year before independence. The last racial union, the Zambia Expatriate Mineworkers Union, was dissolved in 1969. The *Mineworkers Union of Zambia* (MUZ) was formed in 1967 by a merger of the old union with the staff and mine police associations.

During the period of high copper prices up to 1975, MUZ made significant advances in improving the real wages and working conditions of its members, but since 1975 the mining companies have had negligible surpluses due to the falling real price of copper and MUZ has been unable to halt the steady decline of the living standards of its members.

**Table 9**

#### Employment: non-ferrous metals

Year	Copper (cobalt)			Lead/zinc			Total Non-ferrous	% Expat
	Zambian	Expat	%	Zambian	Expat	%		
1964	39 203	7 326	15.7	1 828	490	21.1	48 847	16.0
1968	43 198	4 845	10.1	2 118	366	14.7	50 527	10.3
1972	46 245	4 600	9.1	2 175	295	11.9	53 315	9.1
1976	53 082	4 060	7.1	2 744	224	7.6	60 110	7.1
1980	55 258	2 485	4.3	2 593	123	4.5	60 459	4.3
1984	na	na		na	na		58 104	3.1

#### Sources:

CISB, 1968—80; ZCCM, 1984.

**Table 10**

#### Mining industry safety

Year	Total Labour	Fatalities		Serious injuries*	
		Number	/1000	Number	/1000
1956	48 476	59	1.22		
1960	46 117	58	1.26		
1964	44 718	43	0.96	3 426	76.6
1968	48 611	39	0.80	3 034	62.4
1972	58 267	48	0.82	2 780	47.7
1976	60 520	38	0.63	2 300	38.0
1980	59 175	41	0.69	2 676	45.2
1984	54 800e	22	0.40	1 858	33.9
1985	54 400e	39	0.72	1 820	33.5

#### Notes:

\* more than 3 days lost.

e = estimate.

#### Sources:

MMZ, 1984; ZCCM, 1985 (unpublished).



In June 1985 there was an unofficial strike over the deduction at source of pensions. The strike only had a turnout of about 30 per cent after the first day and was essentially lost, especially in terms of the Union as, after government intervention, membership was made voluntary rather than automatic resulting in a 25 per cent loss of union dues.

Given the fact of the declining profitability of copper mining and that miners are still substantially better off than workers in general (300 per cent better than agricultural workers in 1983), it is unlikely that MUZ will be able to halt the declining real earnings of its members.

### Legislation

The laws governing exploration for and exploitation of minerals are contained in Chapter 329 of the Laws of Zambia, namely the *Mines and Minerals Act of 1976*. The right of searching for and mining of all minerals is vested in the President, in terms of this Act. To prospect, a reconnaissance or prospecting licence must be obtained. It is valid over a defined area, for a limited time period and for the defined mineral/s only and from this right stems the right to demarcate a proposed exploration area not exceeding 26 km<sup>2</sup> in size and to acquire an exploration licence for the specific mineral deposit which is initially valid for three years.

To mine the deposit a mining licence must be obtained for the mineral/s within the prospecting or exploration area and is initially valid for a maximum of 25 years, after which it may be extended. For building or industrial minerals a mineral permit must be obtained and is renewable every 12 months. The Act also has extensive regulations pertaining to the safety of mining operations. All regulations are administered by the Chief Mining Engineer's Department.

The above Act was principally drafted for large scale base metal mining. In 1984 the Act was amended specifically for small mining operations of indus-

trial, precious and semi-precious minerals to include area charges (on prospecting and mining), utilization fees (on industrial mineral mining) and licence fees (flat fee per mineral mined).

Mining companies are liable for income tax at the company tax rate of 45 per cent of their taxable income. All the normal adjustments apply and only the mining specific deductions will be considered here. Prospecting and exploration expenditure is deductible in the year in which it is spent or carried over to income from the subsequent mining operations. Capital expenditure is deductible immediately and the balance over ten years for a lead/zinc mine or twenty years for any other mine, in equal amounts. Mining losses can be carried back against profits for the previous year and any remaining losses are carried forward against future profits.

Mineral tax is not payable for the first five years of operation, after that it operates at the following percentages of taxable income:

• copper	51
• cobalt, lead and zinc,	20
• amethyst and beryl,	15
• gold, selenium, silver, bismuth and cadmium,	10.

Mineral tax itself is an allowable deduction in determining the taxable income for income tax. Mineral export tax is set at 13 per cent of the value of exported minerals and since 1985 is deductible for calculating taxable income.

In 1982 an equity levy was introduced at 1.5 per cent of the Government's shareholding in any parastatal company, but only if it is more than the income tax, in which case no income tax is paid and vice versa if income tax is greater.

Repatriation of dividends to foreign shareholders is allowed, after the payment of with-holding tax, at the rate of 50 per cent of after tax profits accruing to non-resident shareholders or 15 per cent of external paid up capital, whichever is the lesser. Foreign companies

may borrow locally up to the amount that was brought into the country.

### Mining inputs infrastructure

Local production of inputs to the mining industry is fairly diversified with many of the enterprises coming under the ZCCM. In general there exists a significant ability to manufacture locally a wide range of spares and equipment for the mining industry. The major constraint faced by the companies concerned is the shortage of foreign currency to import the necessary raw materials especially the various grades of steels, though this problem seems to have diminished somewhat recently since the introduction by the Bank of Zambia of the system for foreign currency tendering (auctioning).

ZCCM has extensive in-house repair and maintenance capabilities in the divisional workshops and several of the raw materials consumed by ZCCM are produced within the company, by a subsidiary of the company or by a subsidiary of its mother company ZIMCO.

There are also several other companies supplying general engineering and foundry services to the mining industry.

It should be noted that most of the repair and maintenance, and some spares manufacture for the mining industry is undertaken by the extensive engineering workshops of the mining divisions themselves.

Numerous other non-engineering companies also supply considerable inputs to the mining industry.

It is apparent that there exists a substantial local capacity for supplying the necessary inputs to mining, but that this resource is underutilized due to the shortage of imported inputs to these industries, caused by the national shortage of forex which is in turn caused by the rapid decline in the real value of copper over the last decade.

The single most important imported raw material shortage of this sector is iron and various grades of steels. A local

iron and steel industry has been considered for the past twenty years and at one point was on the verge of being created, but the plan has now been abandoned as unfeasible due to the limited local market. Attention is now being given to a regional facility based in Zimbabwe, but the problem of forex will remain as Zambia does not produce products to export to Zimbabwe to generate *Preferential Trade Area* (PTA) credits, except for a limited amount of lead and zinc.

The inability of the mining inputs industries to supply the mining industry with a substantial proportion of its needs has resulted in the ZCCM needing to retain a large part of their forex earnings (about 40 per cent) to finance imports of mining inputs in order to operate efficiently, but due to the forex shortage at the national level the company has only been able to retain about 30 per cent of its export earnings which has resulted in the running down of plant and machinery and lower efficiency and output. This downward spiral has been described by the company as a "self-reinforcing negative process" and the recent rationalization plan is apparently an attempt to break out of it, but at the cost of shutting down a significant part of their productive capacity.

### **Non-ferrous metal transformation**

Many of the foundries mentioned in the previous section use small amounts of copper for alloying but usually from scrap rather than primary metal produced by the local mining industry. The only significant refined copper consumer in the country is *Metal Fabricators of Zambia Ltd* (ZAMEFA).

#### **ZAMEFA**

This company is based in Luanshya and started operations in 1970. It is 51 per cent owned by INDECO (state), 15 per cent by Phelps Dodge (US), 5 per cent by Svenska Metallverken (Swedish), 9.8 per cent by Amax Zambia (US), 9.8 per cent

by ZAMIC (AAC) and 9.4 per cent by Continental Ore Resources Ltd (local). Both Phelps Dodge and Svenska Metallverken provide management and technical services to the company, the former on the extrusion and rod section and the latter on the wire and cable section.

The company has been trying to penetrate the regional (SADCC/PTA) market but with very little success. The main reason for this is that many of the cable consuming power projects in the region are financed by tied aid, but they have also lost open tenders to western countries, partly due to the inability of the Bank of Zambia to offer competitive credit facilities. The regional market for copper semis was estimated at 21 kt in 1984<sup>8</sup>. This would seem to indicate that there is substantial scope for expansion into this market, but it is limited due to the factors mentioned, plus the fact that several of the other states in the region have some copper semis manufacturing capability, especially Zimbabwe where the capacity is possibly superior to that of Zambia<sup>9</sup>. In addition it appears that both countries are at present expanding their capacity with the regional market in mind. It would therefore be in the interest of regional integration if an organization like the SADCC were to attempt to rationalize the production of copper semis and manufactures in the region.

### **Discussion**

The paramount role of the non-ferrous metals industry of Zambia has been as the capital generator and foreign exchange earner for the development of the rest of the economy.<sup>9</sup> It has provoked virtually no downstream development of non-ferrous metal based manufacturing industries in its 55 years of existence. In 1985 over 98 per cent of refined copper production was exported, while less than two per cent was further transformed in the country, of

which about half was exported. The national and regional off-take of lead has been increasing over the last decade, but the lead reserves are almost exhausted. Local consumption of zinc is about 3 per cent of sales, though sales to the east and southern African region (including the RSA) have increased from 7.6 per cent of total sales in 1983/84 to 31.3 per cent in 1984/85.

From 1964 to 1974, during the period of relatively high copper prices, non-ferrous mining supplied the capital to support a rapid expansion in the manufacturing sector principally for import substitution. It also generated the forex for the imported raw materials of these new industries. Due to the high copper earnings between 1965 and 1973 copper mining was able to support an average annual real growth rate of GDP of 3 per cent and real per capita incomes increased by about 20 per cent over the same period. Manufacturing grew from 6.1 per cent of GDP in 1964 to over 13 per cent in 1974.

From 1975 copper earnings began to fall and the average annual growth of GDP from 1973 to 1983 was only 0.2 per cent, a decrease of 93 per cent on the preceding decade. The average annual growth of GNP/capita from 1965 to 1983 was negative at -1.3 per cent and the average annual growth of gross domestic investment from 1965 to 1973 was 6.2 per cent but had fallen to minus 12.5 per cent for the period 1973 to 1983.

Falling terms of trade for copper over the last decade have caused the whole economy to stagnate, bringing into sharp focus the dangers of a development strategy based on raw material exports and the vagaries of the world market. The non-ferrous metals industry of Zambia is vertically integrated into the developed market economies rather than supplying the raw materials for local and regional industry.

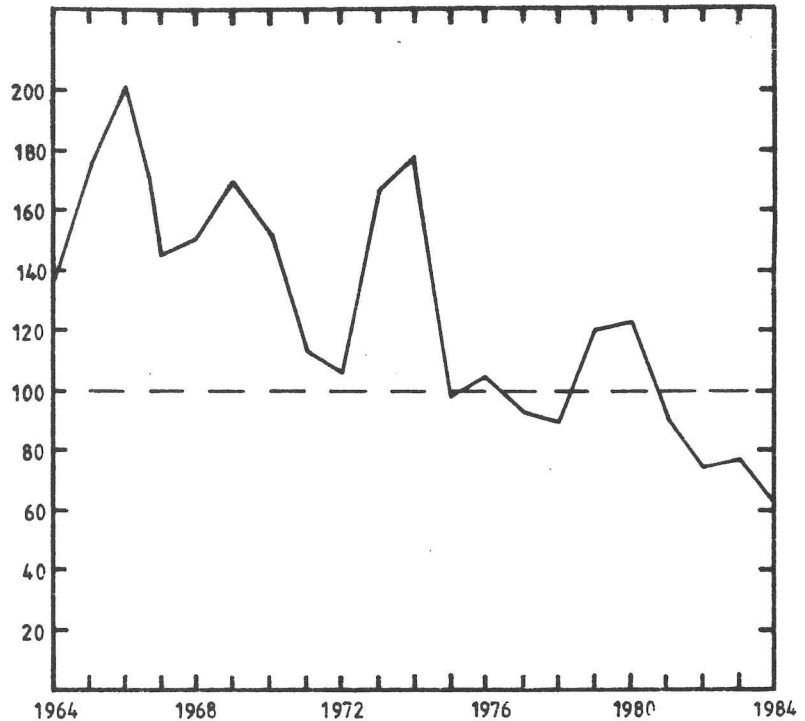
An alternative role for the non-ferrous sector would be to provide the basis for a resource based industrialization strategy. The local and regional

markets are clearly not large enough to absorb Zambia's total copper production even if all imported copper-based products were manufactured in the region, but a significant increase in the production of copper semis and manufactures for export onto the world market would appear to be feasible based on the significant transport costs discount on the LME price for the copper inputs, that would apply. The world market for finished copper based products is more stable than that for copper.

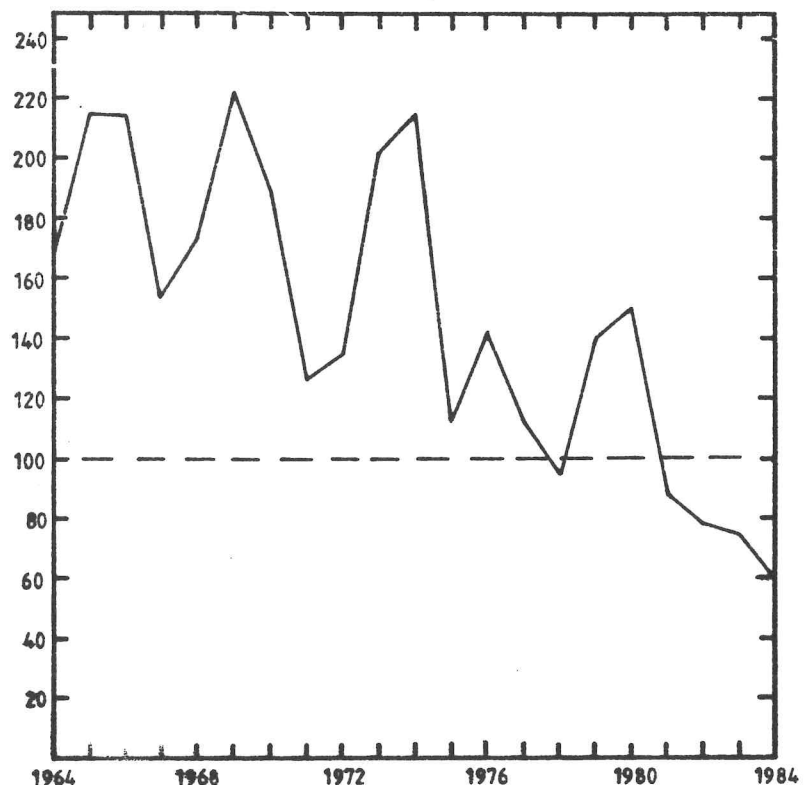
A resource based industrialization strategy would therefore entail firstly the production of non-ferrous based products for the local market, secondly to supply the metal inputs to the regional industries, thirdly to export non-ferrous based products onto the world market and finally to export the remaining production onto the world markets still in the form of metal. For copper the local market could absorb about 2 per cent of production, the regional market about 10 per cent and if a further 40 per cent of production could be transformed before export, it would leave only half of production to be exported as metal with declining terms of trade. For lead and zinc, a regional resource based industrialization programme would enable the absorption of the bulk of production, especially after the planned production cut backs (50 per cent) in three years time.

Over the last decade there has been an alarming stagnation of the Zambian agricultural sector and the resultant drift to the urban areas of peasant farmers. In 1974 cereal imports amounted to 93 kt but by 1983 this had risen 266 per cent to 247 kt. Maize was exported until 1976 (61 kt), but since then imports have had to be made to make up the shortfall. Tobacco exports fell 70 per cent from 1973 to 1983 when 1.5 kt were exported. Average food production per capita decreased by 26 per cent from 1974—76 to 1981—83, though admittedly the coun-

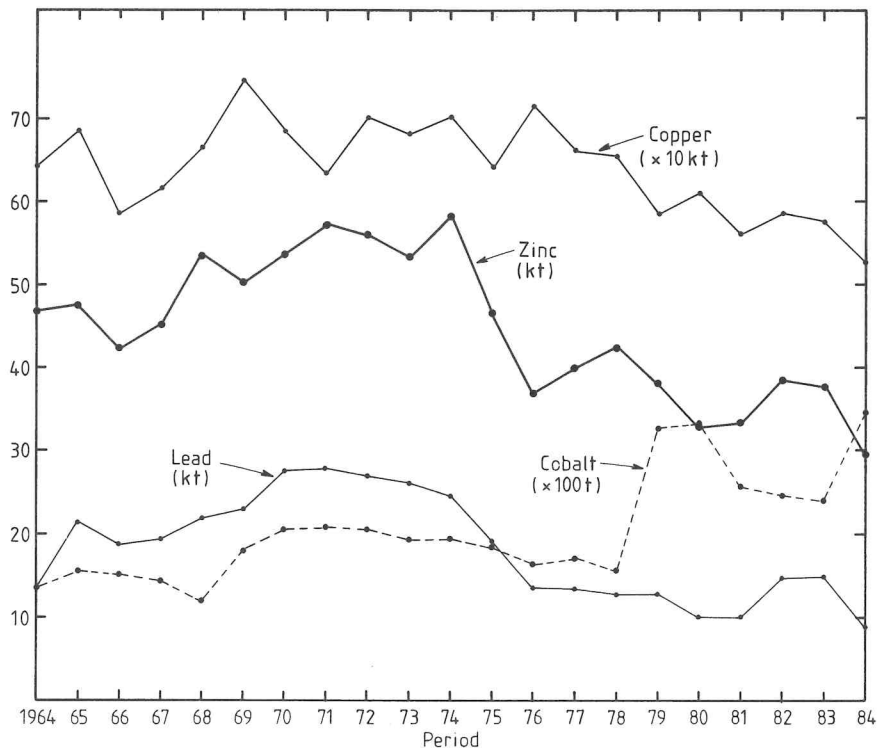
**Fig 1. LME copper price in constant 1960 USD**



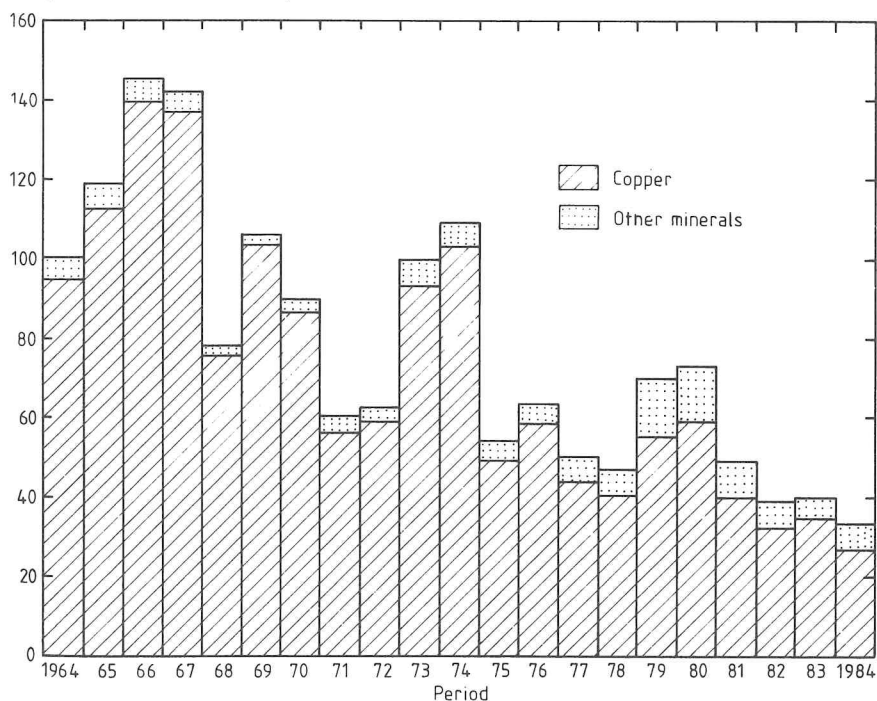
**Fig 2. Zambian copper earnings in constant 1960 USD**



**Fig 3. Zambia: Mineral production**



**Fig 4. Indexed value of Zambian mineral production (1964 deflated USD)**



try was in the throes of a drought in the latter period. The decline in agriculture has resulted in a movement of the rural population to the urban areas. By 1983 the urban population was estimated at 43 per cent of the total, while at the same time earnings and employment in the urban areas have been declining.

The deterioration of the agricultural sector has been in part due to the fall in export earnings provoking a shortage of agricultural inputs, but it is also the result of low producer prices for agricultural commodities. Over the last three years producer prices have increased substantially in an effort to encourage production and at the same time real earnings of urban workers have been falling. Hopefully the combination of these two factors will halt and eventually reverse the drift to the urban areas.

Due to the extremely high dependence of the Zambian economy on non-ferrous metals mining, the restructuring of its economy must not only attempt to restructure the non-ferrous metals sector itself in terms of downstream processing, but must develop the country's other major resource, agriculture, to balance what is presently a lopsided copper economy. Doing this within the present situation of chronic foreign exchange shortages and a massive foreign debt burden is going to be extremely difficult. A regionally integrated approach to the problem could well have a higher chance of success. The countries of the SADCC as a group do not have the same dependence on mining for export earnings. In 1981 about half of their exports were minerals. In addition many of the products presently imported by Zambia are produced elsewhere in the region, while Zambia has both surplus power and land.

The establishment of the regional *Preferential Trade Area (PTA)* has gone some way in reducing tariff barriers and encouraging intraregional trade, but at the end of the day most of the countries in the region do not have the foreign currency to pay for much needed imports

**Table 11****Zambia: Relative mineral production (mine)**

Mineral	% SADCC <sup>1</sup>			% Southern Africa <sup>2</sup>			% West <sup>3</sup>			% World		
	1964	1975	1983	1964	1975	1983	1964	1975	1983	1964	1975	1983
Cadmium	100.0	100.0	—	2.9	2.1	—	*	*	—	*	*	—
Coal	—	18.1	10.2	—	1.1	*	—	*	*	—	*	*
Cobalt	100.0	98.4	89.0	(1.4kt)	13.5	29.9	(1.4kt)	48.4	45.2	(1.4kt)	9.7	12.3
Copper	97.4	92.4	92.5	61.9	47.2	40.1	31.4	24.3	21.3	13.2	9.2	6.7
Gold	na	2.3	2.2	na	*	*	na	*	*	na	*	*
Lead	100.0	100.0	100.0	12.2	26.7	10.9	1.1	1.1	0.9	0.5	0.5	*
Selenium <sup>4</sup>	na	100.0	100.0	na	100.0	100.0	na	3.4	1.5	na	2 e	1e
Silver	100.0	89.0	49.8	0.8	20.4	7.1	*	1.5	0.6	*	0.6	*
Zinc	100.0	100.0	100.0	25.5	19.5	16.1	2.0	2.4	1.2	1.2	0.8	0.6

**Notes:**

e = estimate.

\* = less than 0.5 %.

— = no production.

na = not available.

<sup>1</sup> SADCC: Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe.<sup>2</sup> Southern Africa: SADCC plus Zaire, Namibia and RSA.<sup>3</sup> West: USA, Canada, Europe (except CMEA), Japan, Australia, New Zealand, Israel and RSA.<sup>4</sup> Metal Production.**Source:**

CSO, 1974 &amp; 1985; Metallgesellschaft, 1974 &amp; 1985; BGS, 1985; CISB, 1964; SADCC, 1985.

**Table 12****Zambia: Relative mineral exports**

Mineral	% total exports			% SADCC			% Southern Africa		
	1964	1975	1983	1964	1975	1983	1964	1975	1983
Cobalt	1.0	1.4	2.7	100.0	100.0	91.2	(1.5kt)	10.1	37.0
Copper	83.6	90.6	88.8	(681kt)	93.0	92.7	(681kt)	44.4	40.1
Lead	0.6	1.1	0.7	100.0	100.0	100.0	(13.4kt)	37.0	11.9
Manganese	0.2	—	—	100.0	—	—	(27kt)	—	—
Zinc	2.7	3.9	3.3	100.0	100.0	100.0	(9.7kt)	27.2	26.9

**Note:**

Refer to Table 11 for footnotes and sources.

from their neighbours who in turn are not in a position to provide soft export credits, so must turn to the developed world to import their goods on easier terms. A regional resource-based industrialization strategy would go beyond trade by establishing regionally integrated industries in which case trade balances would become more equitable.

Limited regional cooperation in non-ferrous metal refining has already taken place in the case of copper—nickel matte from Botswana being refined in Zimbabwe. Possibilities also exist for the refining in Zambia of the precious metal slimes from copper refining in Zimbabwe.

At present both Zambia and Zimbabwe are attempting to penetrate the same, fairly limited, regional market for copper and copper alloy semis and finished goods. Regional integration of the transformation of non-ferrous metals would necessitate the planning of the location of manufacturing plants to achieve an equitable distribution of the benefits and to avoid costly duplication.

The SADCC Mining Unit based in Lusaka has commissioned regional studies on the mining sector, several of which are pertinent to the regional integration of the non-ferrous metals industries, namely:

- A skilled manpower survey.
- Small scale mining, processing and marketing.
- Foundry and fabrication facilities.
- Mining machinery manufacture.
- Production of mining chemicals and explosives.
- Sharing of mineral processing facilities.
- Market study for copper semis and manufactures.
- Establishment of a refractories industry.
- Establishment of an aluminium industry.
- Establishment of a regional iron and steel industry (a joint SADCC/PTA project).

Although these studies are likely to come up with proposals that would promote the integration of the non-ferrous metals industries of the region, the present scope of the SADCC as a regional body does not appear to include the establishment of regionally integrated industries.

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<sup>2</sup> RCM, *Roan Consolidated Mines, Annual Reports, 1971 to 1981, Lusaka; Zambia's Mining Industry, The First 50 Years, Public Relations Dept, Ndola, 1978.*

<sup>3</sup> Freeman, *ibid.*

<sup>4</sup> Alabert, J, *The Zambian Copper Industry and its Adaptation to the Crisis*, unpublished paper, SADCC Mining Sector Unit, Lusaka, 1985.

<sup>5</sup> World Bank, *World Development Report 1985*, OUP, London, 1985.

<sup>6</sup> MEMACO, Minerals Marketing Corporation Ltd, *Annual Reports, 1983 to 1985, Lusaka.*

<sup>7</sup> CSO, Central Statistical Office; *Monthly Digest of Statistics*, Vol X No 4 and Vol XXI No 8&9, Lusaka, 1974 and 1985.

<sup>8</sup> Vingerhoets, J W & Sannen A D, *Fabrication of Copper Semi-manufactures in Zambia*, Technical University of Eindhoven and Tilburg University, 1985.

<sup>9</sup> In the second article in our series on the mineral economies the mining industry of Zimbabwe was analysed (Raw Materials Report Vol 4 No 2). Much of the discussion on Zimbabwe, a neighbouring country, is of relevance to the Zambian mining sector, especially in terms of the role of mining in industrial development and the regional dimension of mining, refining and manufacturing.

<sup>10</sup> Jourdan, P, *Mining in the SADCC, Raw Materials Report, Vol 3 No 3, Stockholm, 1985.*

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