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MINERALS INDUSTRY OF ZIMBABWE

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REPORT NO. 107
APRIL 1990

INSTITUTE OF MINING RESEARCH
UNIVERSITY OF ZIMBABWE

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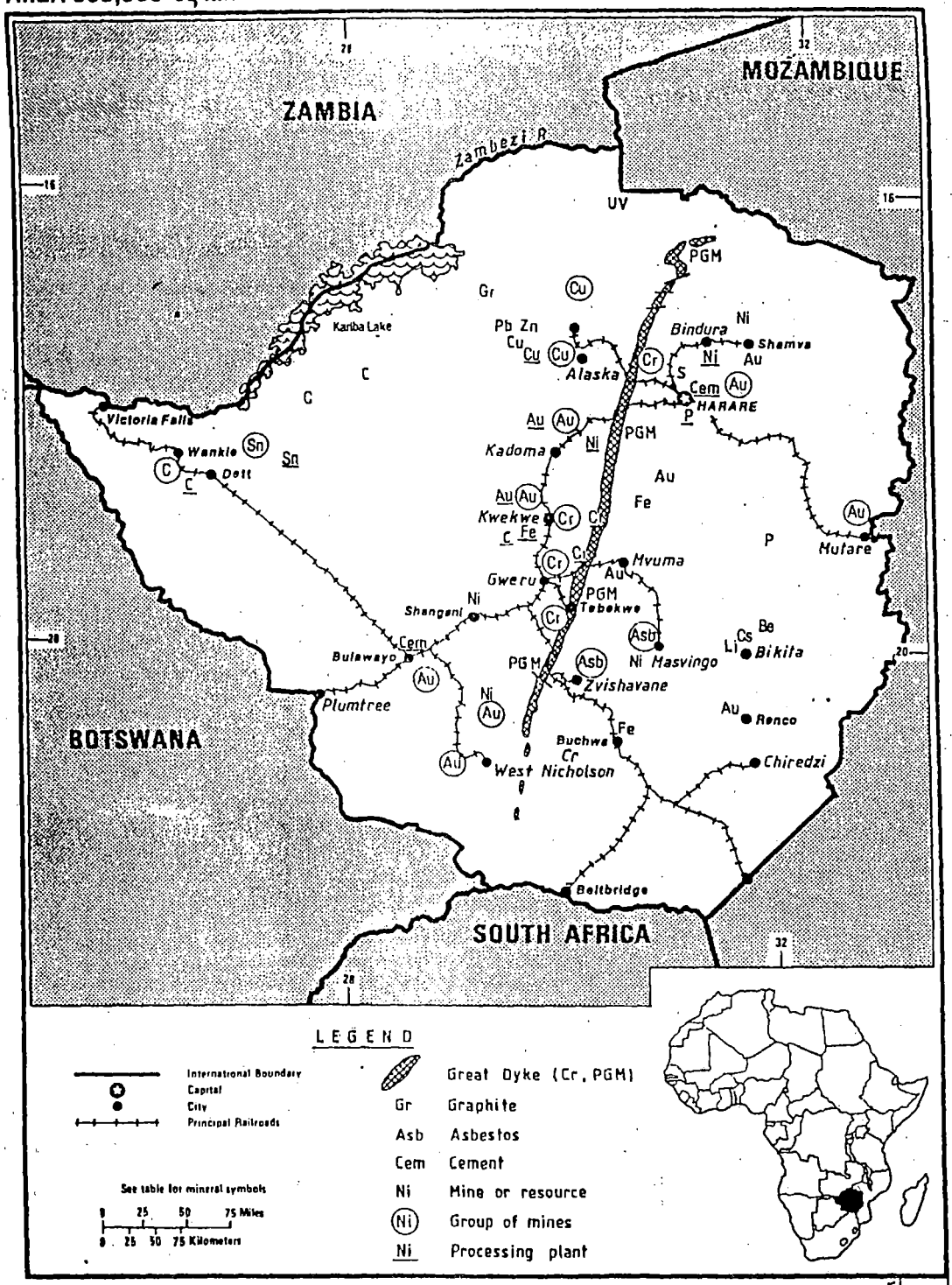
ZIMBABWE

AREA 389,000 sq km MINERALS



Source : USBM 1984

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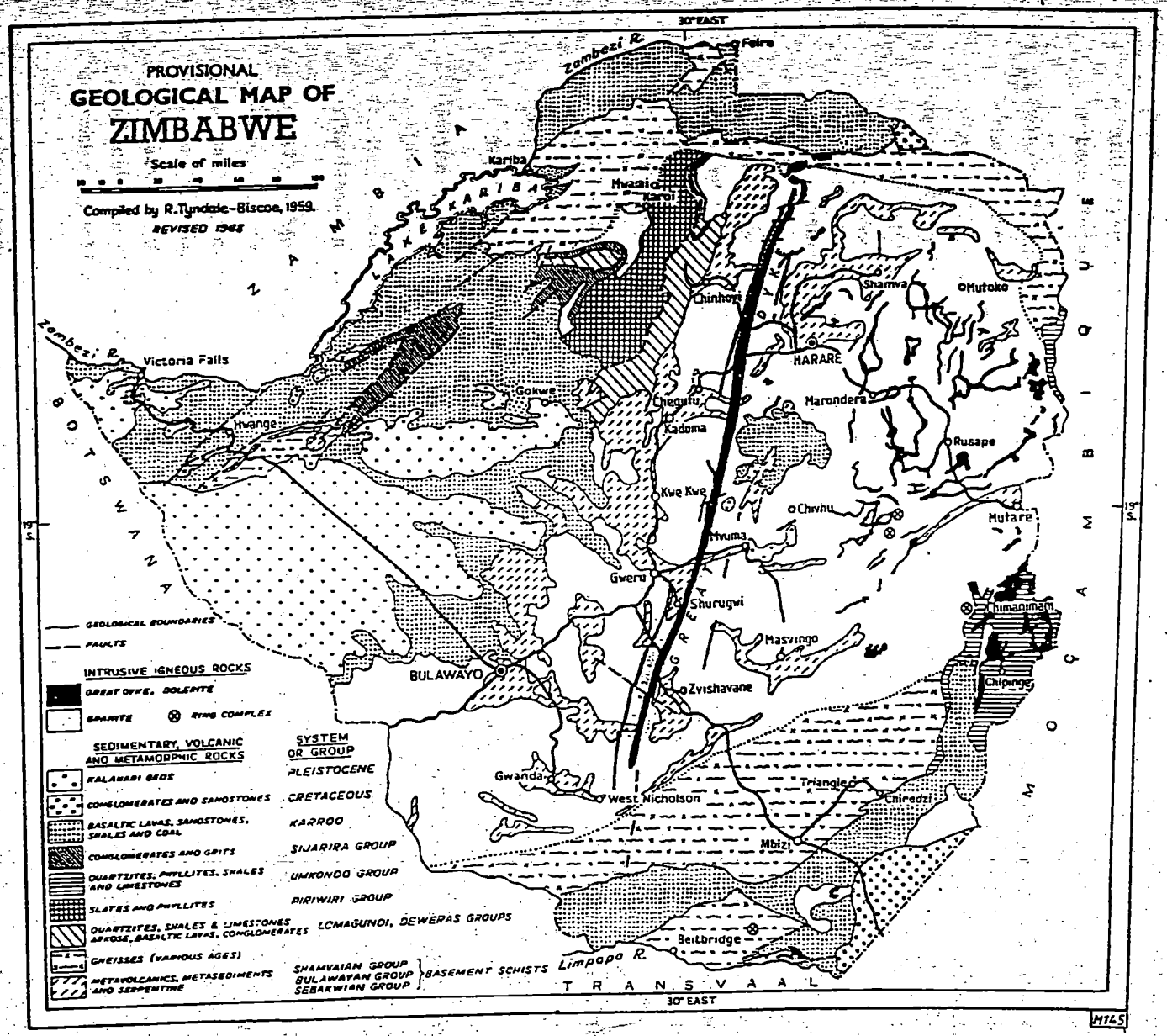
PROVISIONAL
GEOLOGICAL MAP OF
ZIMBABWE
Scale of miles
Compiled by R.Tyndale-Biscoe, 1959.
REVISED 1965
30° EAST
Zambezi R.
Feira
Kariba
Hwange
Victoria Falls
Gokwe
Chinhoyi
Sharwa
Mutoko
HARARE
Chegutu
Marondera
Kadoma
Rusape
Kwe Kwe
Chivhu
Mutare
Hwuma
Gweru
Shurugwi
Chimanimani
Masvingo
BULAWAYO
Zvishavane
Chipinge
Gwanda
West Nicholson
Triangle
Chiredzi
Mbizi
Beitbridge
Limpopo R.
TRANSVAAL
30° EAST
GEOLOGICAL BOUNDARIES
FAULTS
INTRUSIVE IGNEOUS ROCKS
GREAT DYKE, DOLERITE
GRANITE
RING COMPLEX
SEDIMENTARY, VOLCANIC AND METAMORPHIC ROCKS
SYSTEM OR GROUP
KALAHARI BEDS
PLEISTOCENE
CONGLOMERATES AND SANDSTONES
CRETACEOUS
BASALTIC LAVAS, SANDSTONES, SHALES AND COAL
KARROO
CONGLOMERATES AND GRITS
SIJARIRA GROUP
QUARTZITES, PHYLLITES, SHALES AND LIMESTONES
UMKONDO GROUP
SLATES AND PHYLLITES
PIRIWIRI GROUP
QUARTZITES, SHALES & LIMESTONES APROSE, BASALTIC LAVAS, CONGLOMERATES
LOMAGUNDI, DEWERAS GROUPS
GNEISSES (VARIOUS AGES)
METAVOLCANICS, METASEDIMENTS AND SERPENTINE
SHAMVAIAN GROUP
BULAWAYAN GROUP
SEBAKWIAN GROUP
BASEMENT SCHISTS
M765

The Minerals Sector of Zimbabwe

Introduction

History

The early San ("Bushman") hunter-gatherers did not possess smelting technology but did exploit fine-grained, glassy, rocks such as obsidian and chalcedony for the manufacture of stone implements and weapons. Various iron oxide ochres were also used for painting. It was not until the arrival of the Bantu-speaking iron age cultures that the mining and smelting of iron began. Ancient smelting sites, usually identified by slag heaps and tuyer shards, are to be found right across Zimbabwe, the earliest of which has been dated as the 2nd Century[1].

By the 11th Century these people had developed more elaborate forms of social organisation that also included a substantial mining and smelting industry based on other metals such as gold, copper and tin. An Arab traveller, Al Masudi of Bhagdad, visited Sofala, on the Mozambican coast, and reported a large trade in gold and ivory coming from a kingdom in the interior (Zimbabwe) at that time already[2]. From the 11th Century onwards, gold from Zimbabwe was carried by Arab and Swahili traders from the southern African coast to the Arab world and on to the Indian and Asian markets.

The construction of the spectacular stone buildings of Great Zimbabwe, at the time the largest city in sub-Saharan Africa, which took place from the 13th to the 15th Centuries, could well have been related to the dramatic increase in wealth from the thriving gold mining industry at this time. It has been estimated that there exist about 4000 ancient gold workings and about 500 ancient copper workings in Zimbabwe, Mozambique and Botswana, mainly in Zimbabwe on the Archaean schistbelts, principally dating from this period.

Under a Rozvi chief called Mutota, the Munhumutapa (meaning "pillager") Empire was built in the first half of the 15th Century and it split into two at the end of the 15th Century: the Munhumutapa in the north and the Changamire in the south. Both of these groupings controlled numerous shallow gold mines principally in the schistbelts (goldbelts) which occur right across the country.

The rise of mercantile capitalism in Europe brought the Portuguese in the 16th Century, in search of gold, copper and slaves, who sought to replace the lucrative Arab trade that had been in existence since the 10th Century. The Munhumutapa allowed their penetration in the north, but the Changamire refused them entry to the southern region.

In 1573 the Munhumutapa granted the Portuguese mining rights, for gold and other minerals, in northern Zimbabwe and Mozambique. In the late 1620's the Portuguese launched two military campaigns against the Munhumutapa state and installed a puppet Munhumutapa. At the end of the 17th Century the Changamires managed to throw the Portuguese and their puppet Munhumutapa off the Plateau and install a northern vassal kingdom[3]. The Changamires dominated the gold mining industry and gold trade, via the Sabi/Save valley to the coast, until they were routed by the Nguni (Ndebele) invasion under Mzilikazi in the 1840's, fleeing the Boer expansion into the Transvaal.

The 19th Century European explorers such as David Livingstone and Karl Mauch encountered wide evidence of the earlier thriving gold mining industry. In the 1880's the Cape diamond and gold mining magnate, Cecil John Rhodes, sent representatives to the Ndebele capital, Bulawayo, to obtain mineral concessions. In 1889 Rhodes floated the British South African Company (BSAC) and obtained a Royal Charter to install an administration over the Zambezi territories. This was done to contain the Boers south of the Limpopo and because the reputation of the Munhumutapa gold fields had led Rhodes to believe that present day Zimbabwe contained gold deposits to rival the Witwatersrand.

> "The most important single element determining the nature of economic and political development in Southern Rhodesia was the British South African Company's overestimation at the end of the nineteenth century of its mineral resources, and the persistence of this overestimation for roughly fifteen years."[4]

The enormous costs that were incurred by the BSAC in bringing the railway to Bulawayo and in colonising the country were not repaid by the expected mineral profits. This led the company to encourage the formation of a white rural bourgeoisie to develop the agricultural potential and thereby raise the value of the company's assets, particularly the land[5]. In the early days the BSAC demanded a 50% equity of any mining company set up to exploit the minerals.

Rhodes' settler column travelled up to the Shona speaking area in the north-east in 1890, carefully avoiding the Ndebele controlled part of the country in the south-west. After disappointing mineral discoveries in the Shona area the colonialists invaded the Ndebele area in 1893 in the hope of discovering gold deposits there, but the much vaunted mineral riches of Zimbabwe continued to elude them. In 1896 the settlers were nearly wiped out when the Shona and Ndebele rose up together in rebellion at being dispossessed of their land. The first "chimurenga" (liberation war) was finally put down in 1897.

When the BSAC charter expired in 1923 there was a settler referendum to decide on whether or not to incorporate with the Union of South Africa which had been formed in 1910. The result was a clear rejection and in that year the country was renamed Southern Rhodesia and it became a British Crown Colony with "Responsible Government". From then on the country was effectively ruled by the settlers and in 1953, in an attempt to create an economic block to counter the Union of South Africa, the settler-supported Central African Federation of the Rhodesias and Nyasaland was created. This gave the Southern Rhodesian settlers access to the enormous copper mining revenues from Northern Rhodesia, plentiful labour from Nyasaland and the markets of both.

The nationalist movements in Northern Rhodesia and Nyasaland were clearly opposed to the Federation which they rightly saw as being settler dominated (the federal legislature had twenty-nine settler seats and six black seats) and were able to bring about its dissolution in 1963. Soon after they both achieved independence as Zambia and Malawi.

The main nationalist movements, ZANU and ZAPU were banned in the early sixties and in 1965 the settler regime declared unilateral independence (UDI) from Britain and changed the name of the country to Rhodesia. The United Nations responded with economic sanctions against Rhodesia which were not particularly effective as they were never applied by its southern ally, South Africa. The nationalists in exile launched a guerilla war in 1966 which escalated rapidly with the defeat of the Portuguese in neighbouring Mozambique in 1974.

By 1979 most of the country was under martial law and late that year the settlers capitulated at the Lancaster House Conference to majority rule. Independence was gained in 1980 under the Shona-based ZANU party and in 1988 it merged with the Ndebele-based ZAPU party.

The Economy

As effective economic independence was gained from Britain as early as 1923, the country was able to proceed with a more balanced economic development in the thirties and forties than other African colonies. During this period a substantial metallurgical and engineering capacity was installed which was further strengthened during Federation. It was this basic capacity that, with UDI and sanctions,

enabled a wide ranging import substitution development program in the sixties and seventies. In 1987 Zimbabwe had the fourth highest GNP per capita of all sub-Saharan African countries with populations greater than two million (after South Africa, Cameroons and Ivory Coast) and in 1986 it had the highest manufacturing value-added per capita in the whole of independent Black Africa[6].

Due to the global recession, particularly the fall in primary commodity prices, Zimbabwe's GDP has hardly grown in real terms in the 1980's and GDP per capita has actually shrunk over this period. The currency has been devalued from 1.6 USD to the ZD in 1980 to over two ZD to the USD in 1989 in an attempt to compensate for the falling real unit value of exports. This has in part been the cause of the high rate of inflation, about 200% during the eighties, as imported inflation.

Table 1. ZIMBABWE, BASIC INDICATORS

(ZD)	Unit	1980	1981	1982	1983	1984	1985	1986	1987	1988
Population	M	7.4	7.6	7.6	7.7	8.0	8.2	8.4	8.6	8.9
Pop.density	/km2	18.8	19.5	19.5	19.8	20.4	20.9	21.5	22.1	22.7
Forex Rate	/USD	.63	.72	.77	1.01	1.31	1.61	1.67	1.67	1.80
CPI		100	113	125	154	185	201	230	266	288
GDP mp	G	3.44	4.43	5.20	6.31	6.40	7.02	7.73	8.08	9.22
GDP/cap	USD	741	813	893	804	616	535	550	561	576
Exports fob	G	.91	.97	.97	1.15	1.45	1.80	2.17	2.37	
Imports cif	G	.81	1.02	1.08	1.06	1.20	1.45	1.64	1.74	
Trade Balance	M	100	(46)	(113)	89	252	349	530	630	
GFCF	G	.53	.83	1.04	1.24	1.19	1.13	1.32	1.39	
GFCF/GDP	%	15%	19%	20%	20%	19%	16%	17%	17%	
Debt	GUSD	.70	.79	1.22	1.50	1.52	1.53	1.76	2.04	
Debt/GDP	%	13%	13%	18%	24%	31%	35%	38%	42%	
Labour Force	k	1010	1038	1046	1033	1036	1062	1094	1114	1129
Govt Revenue	G+		.95	1.36	1.79	2.21	2.62	3.06	3.63	

Area: 391 k.km2, Currency: Z Dollar, GFCF gross fixed capital formation. Sources: CSO 1987/8/9, Reserve Bank 1988/9.

The rate of investment has been low as the country has generally failed to attract new foreign investment and domestic investment has not been adequate. The investment quotient (GDP/GFCF) has averaged less than 20% during the last decade. National debt, mainly for major investment projects such as the Hwange Power Station, has increased considerably, from 13% to 42% of GDP, but is still manageable (debt servicing constituted about 23% of exports in 1987[7]).

Table 2. ZIMBABWE, TRADE (ZD)

(ZD)		1981	1982	1983	1984	1985	1986	1987
Exports fob	M	972	968	1150	1453	1796	2170	2371
SADCC	M	91	89	108	142	171	200	258
% SADCC		9%	9%	9%	10%	10%	9%	11%
RSA	M	192	138	192	232	167	211	185
% RSA		20%	14%	17%	16%	9%	10%	8%
Imports cif	M	1018	1082	1062	1201	1447	1640	1742
SADCC'	M	76	79	68	65	75	120	131
% SADCC'		7%	7%	6%	5%	5%	7%	8%
RSA'	M	280	239	260	232	273	351	361
% RSA'		27%	22%	24%	19%	19%	21%	21%
% SADCC of Trade		8%	8%	8%	8%	8%	8%	9%
% RSA of Trade		24%	18%	20%	17%	14%	15%	13%

Source: CSO, 1989

During UDI/sanctions the Rhodesian economy became closely linked to that of its much larger ally, South Africa, via a series of trade and transport agreements. The main export market for Zimbabwe's expanding manufacturing sector was South Africa. Since independence the government has attempted to reduce this dependency and from 1981 to 1987, South Africa's proportion of total trade fell substantially, from 24% to 13%. This delinking with South Africa did not lead to an increase in trade with fellow members of the SADCC, which stayed constant, but rather a shift to the developed countries.

Before Mozambique applied sanctions against Rhodesia in 1976, the bulk of the country's foreign trade went via the ports of Beira and Maputo, but after 1976 almost all trade went via South Africa. After independence Zimbabwe attempted to shift its trade routes away from South Africa back to Beira and Maputo and to this end Zimbabwe has maintained a large contingent of troops in Mozambique to guard the Beira corridor from attacks by the South African sponsored MNR. In 1989, troops were sent to reopen the Limpopo line to Maputo. This has been the single most important reason for the large proportion of government expenditure allocated to defence, funds that otherwise could well have been better invested elsewhere, in productive sectors, but the maintenance of alternative export routes is seen by government as being strategically essential.

The contribution of the main sectors to GDP has not changed much since independence. Manufacturing is the largest of the productive sectors followed by agriculture and mining, though it should be noted that the smelting and refining of certain metals (ferrochrome, iron and steel) is classed as manufacturing rather than mining and if all mineral beneficiation is included, the contribution of mining would be closer to 10%.

Table 3. ZIMBABWE, STRUCTURE OF PRODUCTION

	1982		1985		1988	
	MZD	%	MZD	%	MZD	%
GDP factor cost	4657	100%	6227	100%	8295	100%
Agriculture	669	14%	1038	17%	1203	15%
Mining	217	5%	335	5%	529	6%
Manufacturing	1121	24%	1488	24%	2197	26%

Source: CSO 1989.

The Mining Sector[8]

General

The period of settler government with the sanctions that were 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 was developed in the interests of a national bourgeoisie, albeit a minority settler one.

The settlers had effective control of government from 1923 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 factors 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-locked position of the country provoked a downstream development of the mining industry in the sixties and seventies[9] in

order to increase value and decrease weight/volume. Most of the major metals currently produced are reduced to their pure form. Examples are copper cathodes, nickel cathodes, ferrochrome, pure tin, iron and steel.

Processing and refining of minerals was also necessary for import substitution for the metal inputs to industry as a whole (eg. copper for wire and cables). Also, several minerals are mined purely as inputs for local industry (generally on a small scale) such as pyrites (for sulphur), apatite (for phosphates) and clay (for ceramics and refractories), but also on a large scale such as limestone (for cement and lime) and coal (for energy and metallurgy). 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 and an increasing variety of mining chemicals and explosives are also locally manufactured.

Another effect of sanctions was that during UDI the TNC's 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. This also had the effect of increasing the overall control of the TNC's over the economy as a whole.

The major transnational mining houses today have significant holdings in other sectors of the economy. For instance, the AAC has interests in manufacturing, farming, services and finance, Lonrho also has holdings in vehicle manufacture, forestry and textiles, while RTZ plc has a local engineering subsidiary manufacturing agricultural equipment (Tinto Industries). The original capital generally came from abroad[10] but later investment was mainly raised locally, except for RTZ's 1980 investment of 6 MUKP in Renco gold mine.

Today Zimbabwe mines a wide variety of minerals (over forty). The total value of mineral production in 1989 was 1.2 GZD (about 570 MUSD) excluding the value of ferrochrome, pig iron, steel, cement, ceramics and coke. In the same year the principal minerals produced, by value, were gold, nickel, asbestos, coal, copper, chromite, iron ore, tin, limestone and phosphate rock, in that order.

Table 4. ZIMBABWE, BASIC MINERAL SECTOR DATA

(ZD)	Unit	1980	1981	1982	1983	1984	1985	1986	1987	1988
GDP Mining	M	285	252	217	393	320	335	446	529	629
% GDP Mining		8%	6%	4%	6%	5%	5%	6%	7%	7%
GFCF, Mining	M	83	133	94	86	81	30	55		
% Mining GFCF		16%	16%	9%	7%	7%	3%	4%		
Mineral Prod.	M	415	394	383	470	546	630	699	816	986
Min.Prod/cap	USD	89	72	66	60	53	48	50	57	62
Min.Exports	M	429	354	410	482	585	702	932	1039	
% Mineral Exports		47%	36%	42%	42%	40%	39%	43%	44%	
Mining labour	k	66	68	64	60	55	55	55	58	59
% mining labour		6.6%	6.6%	6.1%	5.8%	5.3%	5.2%	5.0%	5.2%	5.2%
Min.Prod/lab	kUSD	9.9	8.0	7.9	7.7	7.7	7.1	7.7	8.5	9.3
average wage	k/an	1.8	2.3	2.8	3.1	3.6	4.1	4.3	4.7	5.2
avg REAL*wage	k/an	1.8	2.0	2.2	2.0	1.9	2.0	1.9	1.8	1.8

*deflated using CPI. Sources: CSO 1989; EIU 1989.

Mineral exports in 1987 totalled 1,032 MZD representing 43.5% of total exports and averaged 42% for the period 1980-87, roughly the same percentage as agricultural exports. The principal foreign exchange earners in 1987 were gold (19% of total exports), ferrochrome (11%), asbestos (4%), nickel (4%), raw steel (2%) and copper (2%). Mining and quarrying contributed 9.6% of the GDP in 1975 but had fallen to 6% by 1987, a slight increase on the low of 4% in 1982 during the height of the recession.

The mining sector's contribution to gross fixed capital formation (GFCF) fell from 16% in 1980 to 4% in 1986 reflecting falling returns from mining ventures due to depressed demand and low world market prices. Investment has since picked up in line with improved mineral prices. Mineral output per miner has remained constant at about 9 kUSD throughout the decade while mining as a proportion of the total formal labour force fell from 6.6% in 1980 to 5.2% in 1988 and has fallen absolutely from 66 thousand to 59 thousand. In real (deflated) terms average mining wages remained constant throughout the decade.

The mining industry is largely in the hands of the transnational mining companies, the most important being Anglo American Corporation of South Africa (nickel, ferrochrome and pyrite), Union Carbide (ferrochrome and gold), RTZ plc (gold), Lonrho (gold) and Turner Newall (asbestos). Since independence state participation has been on the increase. The state has the largest share holding in coal mining, the iron and steel industry (Zisco), tin mining (Kamativi) and in 1984 the newly formed state enterprise, the Zimbabwe Mining Development Corporation (ZMDC) bought out the ailing local mining interests of Messina of South Africa giving it control over most of the national copper and silver production. The state has also set up the Minerals Marketing Corporation of Zimbabwe (MMCZ) which handles all mineral and metal trade with the exception of gold which is bought by the Reserve Bank of Zimbabwe.

Economic Geology

The structural geology of Zimbabwe is dominated by the Zimbabwean Craton, cut by the Great Dyke and surrounded by rift valleys in the north and north-west (Zambezi Rift) and mobile belts in the north (Zambezi Belt), east (Mozambique Belt) and south (Limpopo Belt). In fact the only geological border that does not coincide with a political border is in the south-west where the border with Botswana runs across the Zimbabwean Craton. The craton is overlain in the north, north-west and east by Proterozoic and Phanerozoic sedimentary basins.

This uncanny coincidence of political and geological divisions has sometimes been attributed to foreknowledge of the geology on the part of Cecil John Rhodes during the final delimitation of the region's frontiers in the 1880's and early 1890's, but it is more likely that the BSAC had a vague idea of the distribution of the fabled Munhumutapa gold fields, from explorers such as Karl Mauch, and that the settlers, who in many ways determined the land which they wanted to expropriate, preferred the malaria free, more temperate highlands of the Craton.

The Craton was formed during the early Archaean (3.6 to 2.5 billion years ago) and consists of granites and gneisses which contain few economic minerals except for vein (pegmatite) deposits near contacts, but the Craton also contains the economically important schistbelts also known as the greenstone or gold belts which comprise a volcano-sedimentary sequence containing most of the mineral deposits currently exploited. These include, in order of current value of output, the vast majority of gold deposits, the nickel-copper-cobalt deposits (Trojan, Shangani and Epoch), the asbestos deposits (Shabanie, Gaths and King), the podiform chromite deposits (Shurugwi, Valley and Inyala), the iron ore deposits (Buchwa, Ripple Creek and Mwanezi), numerous limestone deposits (Sternblick, Cleveland, Zisco and Early Worm), the lithium pegmatite of Bikita, the Sandawana emeralds, pyrites (Iron Duke), the Barton Farm magnesite and numerous minor deposits of lead, zinc, antimony, tungsten, tin, barytes and corundum.

The Limpopo Mobile Belt runs SSW-NNE in the south of the country, divides the Zimbabwean and Kaapvaal Cratons and consists of metamorphosed cratonic rocks containing gold deposits (Renco), corundum and magnesite occurrences. It has a complex polyphase history spanning the early Archaean (greater than 3.2 billion years) to the mid-Proterozoic.

The Proterozoic is represented by two major sedimentary basins, in the north-west (Deweras, Lomagundi and Piriwiri Groups) and on the eastern margins of the craton (Umkondo Group). The former consists of metasediments and volcanics and are economically important for their copper deposits (Miriam, Norah, Shackleton and Angwa) and also contain important resources of copper-lead-zinc (Copper Queen and King), dolomite (Springbok), gold, tin (the Kamativi pegmatite), graphite (Lynx), kyanite, tantalum (tantalite pegmatites) and gemstones. The Umkondo Group on the eastern border is relatively unimportant economically, but has limestone and copper occurrences.

By far the most spectacular igneous body is the Great Dyke, also of Proterozoic age (2.5 billion years ago), stretching over 500 km NNE to SSW in the centre of the country. This layered intrusive contains enormous reserves of stratiform chromite all along its length (Lalapanzi, Mutoroshanga, Great Dyke and Vanad) and also contains large, presently unexploited, reserves of platinum, palladium, nickel, copper and gold in the four norite complexes of Musengezi, Hartley, Shurugwi and Wedza.

The other Proterozoic igneous event was the intrusion of the numerous Mashonaland dolerite sills and dykes about 1.9 billion years ago right across the craton, but with a concentration of sills in the north-east. These contain resources of nickel and copper (Madziwa) and are currently exploited for ornamental stone, the so-called "black granite" of Mutoko.

The Proterozoic Mobile Belts flanking the Craton on its northern and eastern sides consist of metamorphic rocks in the Mozambique Belt (east) and the Zambezi Belt (north) with mineral occurrences of kyanite (Ky) pegmatites with tungsten, tantalum, mica, beryllium and gemstones.

The Karoo System sediments and volcanics of the Phanerozoic were laid down in three main basins, the middle and lower Zambezi basins in the west and north and the Save-Limpopo basin in the south and south-east, and contain all of Zimbabwe's large coal resources, mainly in the sandstones and shales of the Ecca Series, and also has resources of fireclay, limestone, diaspore, and a significant uranium and vanadium sandstone deposit has recently been delineated at Kanyemba in the Zambezi Valley. After the Karoo volcanics the post-Karoo Libombo, Limpopo and Botswana dolerite dyke swarms were implaced, but contain no mineral occurrences.

The Mesozoic intrusive alkali carbonate ring complexes of Dorowa, Shawa and Chishanya, in the centre-east of the country, are important for their resources of phosphate rock (apatite) and vermiculite. The intrusive kimberlite pipes north of Bulawayo and near Beitbridge are pre-Karoo while those near the start of Lake Kariba are post-Triassic (Sebungwe), but none are particularly rich in diamonds. The Mutandawhe granitic intrusion in the south-east is thought to be late Jurassic and contains a significant low grade molybdenum resource and tungsten deposits.

During the late Jurassic to early Cretaceous, sandy sediments were deposited in various places and are of no economic importance, not indeed are the Tertiary Kalahari aeolian sands covering the south-east of Zimbabwe, but a minor Tertiary-Quaternary diatomaceous earth deposit has recently been identified in the Zambezi Valley near Chirundu in the north-east.

Legislation

The right of searching for and mining of all minerals is vested in the President, in terms of the Mines and Minerals Act. To prospect a prospecting licence (about 1 USD) or an Exclusive Prospecting Order (EPO) must be obtained. An EPO is valid over a defined area, for a limited time period and for the defined mineral/s only. From this right stems the right to peg a claim and dispose of the minerals won. Unlike other countries in the SADCC no special mining licence is required. The land owner is recompensed for the loss of the land use at a nominal rate by government.

In terms of tax, repatriation of profits and other fiscal matters, the mining companies fall under the general laws governing these aspects for the whole of the economy. However, in 1989, with the launching of the New Investment Code, it was announced that a new tax regime specifically for mining was to be formulated that would take into account the high risk nature of the mining industry.

Income tax is 50% of the taxable income of the company. In terms of mining companies the following allowances apply: They can deduct the initial capital expenditure as it is incurred or over a number of years over the life of the mine up to a maximum of ten years; expenditure incurred in exploration can be deducted immediately or carried forward and allowed against subsequent mining income; a depletion allowance of 5% of the value of mineral production and a replacement allowance for later capital expenditure are both deductable.

Other general, not mining specific, allowances also apply, such as the Growth Point Allowance for investments in depressed rural areas, and the Training Investment Allowance. Companies incorporated outside Zimbabwe are subject to a branch profits tax of 8.4% but a locally incorporated subsidiary of a foreign company is not liable. Legislation exists for the payment of royalties by mining companies at the rate of 4% of output value but was suspended in the seventies in an arrangement to encourage the companies to install local beneficiation plants (the Alaska copper refinery was built under this scheme) and has apparently not been reapplied due to the depressed metal markets in the eighties. However it was not reintroduced with the upturn in prices in the late eighties, in part due to the fact that the state is now the principal producer of two of the three base minerals (copper and tin).

New foreign venture capital may be fully repatriated after two years after deducting amounts already remitted. The balance can then be remitted over six years in equal amounts with the interest accrued. Under the new Foreign Investment Code of 1989 investments accorded Venture Capital status will have a minimum remittability of 50%, negotiable to 100%, of after tax profits as dividends which are then subjected to a non-residents shareholders tax of 20%, unless there is a tax agreement with the country of origin of the investment, such as exists with the United Kingdom (5%) and the Federal Republic of Germany (10%). In addition to being a signatory to the UNCITRA and International Chamber of Commerce agreements, in 1989 Zimbabwe agreed to subscribe to the MIGA system for the protection of foreign investments and for arbitration to be settled under the Convention on the Settlement of Investments Disputes between States and Nationals of other States.

Zimbabwe dollars can be purchased for new investment for approved projects at a discount rate (about 65%) through the purchase of blocked funds held in Zimbabwe by foreigners or foreign companies, on a willing buyer - willing seller basis, similar to the financial rand system in South Africa.

Mining companies with more than 25% foreign ownership may not borrow locally more than 35% of the shareholders funds plus the ratio of the local share interest to the foreign share interest multiplied by the 35% of the shareholders funds, or they lose the right to repatriate profits (for other companies 25%). This formula is to encourage foreign concerns to bring new, foreign, capital into the country for new capital investment. It also encourages locally incorporated foreign companies to raise capital for local expansion by increasing the equity base locally, thereby diluting the foreign holding.

The Zimbabwean government is currently reviewing its whole trade strategy with a view to implementing a tariff rather than quota based import regime, which should eliminate the present bottlenecks in the importation of essential mining inputs and has decided to allow the mining sector 5% retention of forex as earnings from October 1990.

Since independence there has been virtually no new foreign investment in mining other than RTZ plc (Renco gold mine, 6 MUKP in 1980) and Cluff Minerals plc (5 MUSD in the Freda-Rebecca gold mine in 1987/8), though several new projects are at the decision stage. The reasons for this have been the depressed outlook for base metals over most of the decade, the low proportion of profits that could be repatriated (35% until 1989) and the perceived regional instability arising from the South African regime's erstwhile policy of destabilisation of neighbouring states.

Minerals Marketing

Before 1983 marketing was done by the companies, usually through agents in the OECD countries. Up until the beginning of 1980 sanctions were applied to the then Rhodesia, so the marketing methods tended to be devious and clandestine. Since 1983 all mineral exports, except gold, have been controlled by the Minerals Marketing Corporation of Zimbabwe (MMCZ) which was set up by government in 1982 officially to rationalise selling arrangements, remove restraints on minerals trade and to reduce costs to producers, but unofficially to eliminate transfer pricing.

It was initially received by the industry, especially the TNC's, with great foreboding and they fought unsuccessfully against its establishment[11]. Over the last decade they seem to have come to terms with it, particularly as, in some instances, higher prices have been obtained and middlemen have been eliminated and, more importantly, in many cases the old agents and channels are still being used. There have however been well-documented instances where the old agents have been receiving inflated commissions and have not always managed to obtain the optimal world market price for the minerals sold.

In 1989 the MMCZ bought into two of its principal agencies in Switzerland, Salg and Gencom of Zurich, for over one million Francs, and formed a new company called MMCZ Sales AG in which it holds 50% of the equity with an option to increase the holding to 100%. The main reason for buying these Swiss agencies rather than setting up a new company, was to acquire the skilled personnel in the two agencies, but as they in turn sell through sub-agents, there does not appear to be much expertise to be acquired. Half of all profits coming from commissions on Zimbabwean minerals sold will now accrue to MMCZ.

Recently, the industry has called for the removal of the MMCZ on the grounds that it is losing money through less than optimal sales contracts (substantial sums were lost in the nickel boom in 1988 due agents selling ahead at low prices). Although the initial establishment of the MMCZ has been seen as a victory of the government's "socialist" policies immediately after independence[12], there appears to be good evidence that the inefficiency of the MMCZ may be more expensive than the losses through transfer pricing. A confidential assessment of the MMCZ concluded that millions of dollars were being lost, not only through inefficiency and the use of old TNC agents, but also possibly through corruption, but the issue was not taken up by the Attorney General's Office[13]. The range of Zimbabwe's mineral exports and the generally small quantities of any one mineral make it difficult for the MMCZ to have people proficient in all aspects of all minerals traded. A minerals marketing monitoring commission could possibly be a more appropriate strategy given the skills constraints of the MMCZ, where spot checks were made on random deals, possibly using outside consultants, with heavy penalties for transfer pricing.

Labour

Workers committees were instituted shortly after independence in 1980. The principal workers union is the Associated Mine Workers of Zimbabwe (AMWZ), which is affiliated to the Zimbabwe Congress of Trade Unions (ZCTU). Minimum wages are set by government in consultation with the companies and the union, but since 1980 the minimum has only barely kept pace with inflation. There have been

extremely few work stoppages or strikes over the last decade, and most that have occurred have been over specific mine related problems rather than the national minimum wage rates or rights of workers. A large proportion of mine labour used to be foreign (60% in 1965 and 47% in 1972[14]), mainly Malawians and Mozambicans, but since independence most of them have been naturalised. The slump in metal prices in the mid-eighties had a severe effect on the union; membership fell from roughly 30,000 in 1980 to 20,000 in 1985 then grew to 31,000 in 1989, representing over half of the workforce. Since 1980 permission from the Ministry of Labour has been necessary in order to fire or lay-off a worker.

The new labour legislation (The Labour Relations Act) that came out in 1985 got a mixed response from both workers and management. From the workers' point of view, the positive aspects of the Act are the right to join a union, protection from discrimination, protection of union officials from victimisation and that the employer will in future send union dues direct to the union and non-members may be levied. On the negative side are severe controls on the right to strike and the wide discretionary powers given to the Minister of Labour who can now nullify union congress election results and control the use of union funds. In the opinion of the union the Act attempts to limit union struggle to economic objectives only thereby depoliticising union activity.

Other legislation affecting mine labour is the Emergency Powers Act, the Pneumoconosis Act, the Workers Compensation Act and the Mines and Minerals Act which has Health and Sanitation Regulations.

The frequency of expatriates on foreign contracts is extremely low, about 1% of skilled labour in 1986[15], but the number of professional and managerial staff from the "settler" section of the population is extremely high at over 60%. Very few indigenous professionals and managers were produced for the mining industry during the colonial/settler period. This has improved over the last 15 years, especially through mining company in-house training, but it will still be a long time before the mining industry has a majority of indigenous professionals and managers.

In the 1980's a Department of Mining Engineering and a Department of Metallurgical Engineering were opened at the University of Zimbabwe with West German aid, and their first batches of graduates have already entered the industry. According to a study done in 1986[16] the output is adequate for current demand but not enough to make up for the number of engineers leaving the country. The University also has a long-standing Department of Geology, a geophysics section under the Physics Department, and an Institute of Mining Research. At a technical level, there is a School of Mines in Bulawayo for the training of mining and mineral processing technicians, but due to falling real wages, it has not been able to attract suitably qualified instructors and a proposal to make it a parastatal under the Ministry of Mines with salary "top-ups" from the Chamber of Mines, is currently under consideration.

Mineral Production

General

Due to depressed real prices for most minerals in the first half of the decade, there has been little expansion in mineral production since 1980 except for coal, gold and graphite. In USD terms the total value of mineral production fell by 13% from 1980 to 1989, from 660 to 574 MUSD, against a three-fold increase in ZD terms, 415 to 1195 MZD.

Low world market prices, particularly in the first half of the decade, also provoked serious financial difficulties for the mining companies concerned, several of which registered substantial losses and incurred heavy debts, particularly in the mid-eighties. Although this situation improved 1987 and 1988, real prices for most minerals continued their downward drift in 1989. During the worst of the recession,

in the early eighties, the state stepped in by supplying loans, with an option of converting their value into equity, on the condition that production continued.

Table 5. ZIMBABWE, SELECT MINERAL PRODUCTION

		1970	1975	1980	1985	1989	Avg[1]	70-89	80-89
Asbestos	kt	188	262	251	174	187	218	-0%	-25%
Chromite	kt	504	876	552	526	627	606	25%	14%
Coal	kt	3520	3300	3134	3030	4680	3446	33%	49%
Copper	kt	30.0	47.6	26.9	20.4	15.7	30.4	-48%	-42%
Gold	t	13.6	11.0	11.4	14.7	16.0	12.9	17%	39%
Graphite	kt	5.7	6.5	7.4	10.4	16.9	9.5	198%	129%
Iron Ore	kt	813	1246	1622	1100	1143	1051	41%	-30%
Limestone	Mt	1.06	1.37	1.22	1.32	1.37	1.27	30%	12%
Lithium mins	kt	16.7	.9	21.0	27.9	20.6	18.7	24%	-2%
Magnesite	kt	120	99	78	19	33	65	-72%	-57%
Nickel	kt	8.6	9.1	15.1	9.9	11.6	11.8	36%	-23%
P (Apatite)	kt	108	151	130	135	134	127	24%	3%
Pyrite	kt	70	67	68	57	48	57	-32%	-30%
Quartz	kt	114	193	166	74	62	111	-46%	-63%
Silver	t	6.8	7.5	29.7	24.9	22.3	19.4	226%	-25%
Tin	kt	1.09	1.00	.93	1.21	.85	1.05	-22%	-9%

[1]average for 1970-89, Source: IMR SADCC Database.

Gold

In the 1,200 years preceeding European colonization, it is estimated that about 4000 ancient mines produced between 600 and 800 tonnes of gold "...with a normal production during their heyday of about 20,000 oz. a year"[17] and "the gold trade was directly responsible for the rise of the Zimbabwe state"[18]. Gold output peaked in 1916 at 28.94 tonnes and in the last one hundred years (1890-1989) of modern mining 1530.5 tonnes have been produced. In 1979 gold replaced asbestos as Zimbabwe's most valuable mineral produced and it competes with ferrochromium 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 1988 17 producers of over 300 kg/annum produced 72% of the total national output of 14.3 tonnes, 11 producers beween 150 and 300 kg produced 19%, while 655 producers of less than 150 kg/annum contributed the other 9%. 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 numerous small-scale gold mines by providing expertise, assaying, loans, hire of equipment, and by guaranteeing a fixed gold price (900 ZD/oz. in 1990). In addition the state roasting plant in Kwe Kwe custom treats refactory ores. In 1988 the state gold refinery was opened in Msasa with a capacity of 90 tonnes of Au/annum, well above the foreseeable national needs, to cater for refining from other states in the region.

Gold mining employed 26,377 people in 1988 constituting 45% of the total mining industry workforce and the value of gold output in 1989, 412 MZD, represented 35% of total mineral production. Production per worker fell from 21.8 oz. in 1975 to 19.5 oz. in 1989 and gold exports contributed 19% of total exports in 1987.

Lonrho plc of the UK produced 4.4 tonnes of gold in Zimbabwe in 1989 from eight mines. In 1985 the company announced an investment program that would have increased production to 6 tonnes by 1988, but overall output has remained roughly constant (4.5 tonnes in 1985). Five of the mines are owned via

its subsidiary in Zimbabwe, Independence Mining (Pvt) Ltd. (Athens, How, Shamva, Tiger Reef and Redwing/Old West mines). It also owns another three gold mines via its holding company Willoughby's of the UK which in turn owns Corsyn Consolidated Mines Limited in Zimbabwe (Arcturus, Mazowe and Muriel mines). Corsyn used to be owned via Lonrho's South African subsidiary, Coronation Syndicate, until 1986. 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.

Table 6. ZIMBABWE GOLD PRODUCTION 1989
(tonnes, estimates)

Lonrho Zimbabwe	4.4	27%
RTZimbabwe	2.7	17%
Cluff Zimbabwe	2.2	14%
Falcon Mines	1.4	9%
Forbes & Thomp.	1.0	6%
Falconbridge	.8	5%
ZMDC	.5	3%
Union Carbide	.4	2%
Golden Valley	.3	2%
Boulder Mining	.3	2%
Olympus Mining	.3	2%
Others	1.9	12%
Total:	15.94	100%

Source: IMR Database 1990

RTZ plc of the UK has a local subsidiary, Rio Tinto Zimbabwe Ltd., which operates the second largest gold mine, Renco, in the south-east of the country. In 1989 1.43 tonnes of gold were produced from 237 ktonnes of ore grading 6.02 g/t. At the end of 1989 reserves stood at 5:4 tonnes contained gold, compared to 3.1 tonnes in 1979 when it was operating as a small-scale plant. After independence in 1980, the parent company in London invested five million UKP in its local subsidiary and operations were expanded considerably. Rio Tinto also owns two smaller operations: Patchway/Brompton (639 kg of gold in 1989) and Cam dump retreatment plant (323 kg of gold in 1989). Reserves at the former stood at 1.7 tonnes contained gold in 1988 and a major 15 MZD expansion project is underway at the latter which will increase output four-fold to 650 kg/annum.

One of the few post-Independence investors is Cluff Minerals of the UK who started out with a dump retreatment operation at the Royal Family mine (His Majesty) in the south-east near Filabuzi. In 1988 Cluff invested a further 5 MUSD for the the development of the large Freda-Rebecca (Dandadzi) operation near Bindura. By 1989 this was the largest producer in the country, with an output of 1.9 tonnes of gold from about one million tonnes of ore. Zimbabwe is the main source of revenue for Cluff plc of the UK.

This is the first Zimbabwean operation treating large tonnages of low grade ore by heap leach. This type of operation was the main source of new gold in Western Australia's spectacular ten-fold expansion during the eighties and it would appear that Zimbabwe has substantial potential for many more of these operations.

Falcon Mines plc operates three gold mines (Dalny, Venice and What Cheer) which in 1989 produced 1.42 tonnes of gold. For the last few years though this company has made a loss (-2.5 MZD for the year ending 31:3:89) due to a series of problems at its main producer, Dalny, where the management is attempting to retrench some of the workforce. Although Falcon Mines is registered in the UK, its only

mines are in Zimbabwe and its Annual Financial Statements are presented in Zimbabwe dollars. Falcon is also the principal shareholder (40%) in Olympus Gold Mines which operates two mines, Old Nic and Dawn which produced just under 0.3 tonnes of gold in 1988.

Forbes and Thompson (Pvt) Limited is a local mining company with two mines in the south-east of the country (Gwanda), Vubachikwe and Freda, which together produced about 81 tonne of gold in 1989. This company is the largest locally-owned gold mining concern in the country. Another local gold mining company is Boulder Mining of Bulawayo who bought the Indarama mine and the Broomstock prospect, near Kwe Kwe from Norman Levin Gold Mines in 1986. They also own the "C" mine in Mberengwa and their total gold production was about 300 kg of gold and 160 kg of antimony in 1989. Broomstock is being developed as a high tonnage low grade heap leach operation and is expected to treat about 50 kt/month of ore grading about 1.5 gm/tonne in 1991 (about 0.9 tonnes of gold). Norman Levin Gold Mines continues to produce about 190 kg/an from their Joyce/Roma property.

Falconbridge Nickel Corporation of Canada has gold mining interests in Zimbabwe via its subsidiary Falconbridge Investments Zimbabwe (Pvt) Ltd. which owns Blanket Mines (1983) (Pvt) Ltd. which runs two gold mines (Golden Kopje and Blanket mines). Golden Kopje was acquired at the end of 1983 after having been closed for 40 years and in 1988 these two mines together produced about 750 kg of gold.

The state mining holding company, the Zimbabwe Mining Development Corporation (ZMDC), owns the Jena, Sabi and Bar-20 mines and is bringing the Elvington mine into production. In 1988 the ZMDC group produced about 0.45 tonnes of 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 kton of ore per year, producing roughly 340 kg of gold annually.

All gold bullion is bought by the Reserves Bank and refined by the new state refinery, Fidelity Printers and Refiners, built with assistance from the Perth Refinery in Australia.

The second half of the decade has seen renewed gold exploration activities by both new and established companies. New companies have been African Gold of Ireland, Sons of Gwalia (SOG) and Delta Gold of Australia and Plateau Minerals (Robertson) of the UK. The Zimbabwean SOG subsidiary, Chase Minerals (Pvt) Limited, has been assessing the Connemara deposit near Kwekwe, and Delta's Masasa Mines has been looking at several gold properties. Two established companies that have stepped up their gold exploration activities are Anglo American Corporation (AAC) and Union Carbide Corporation, through their subsidiary, Mimosa Mines. AAC commissioned its Isabella Mine, near Bulawayo, in 1989 and several dump retreatment operations are under development.

Nickel

Due the price recovery at the end of the decade, in 1989 nickel was the second mineral both in terms of production (11.6 kt, worth 284 MZD) and exports. In 1987 exports of 15.8 kt, including toll-refined production, were worth 93 MZD. Exports stood at 3.6% of total exports in 1975 and rose to 4.0 in 1987. Production was 1.3% of world output in 1988. Nickel mining employed 4154 people in 1988, 7% of the total mining labour force and production per employee rose from 1.7 tonnes in 1980 and 2.8 tonnes in 1988.

Anglo American Corporation of South Africa (AAC of SA) has a majority share in Bindura Nickel Corporation (BNC) of Zimbabwe. 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 1988 these mines produced 11.43 kt of nickel, 0.9 kt of copper and 117 tonnes of cobalt in cake, from 2.7 Mt of ore milled. The average mill head grade was 0.62%, one of the lowest in the world for a sulphide deposit, and the average final recovery was 68%. In addition, 2.1 kt of nickel and 2.2 kt of copper were toll refined from BCL (Botswana) copper-nickel sulphide matte.

Table 7. BINDURA NICKEL CORP. FINANCIAL PROFILE

	1982	1983	1984	1985	1986	1987	1988	1989
Capital Employed	131.2	163.6	178.6	169.0	178.9	185.0	224.4	364.9
Assets	75.1	116.6	116.9	117.7	118.4	119.3	121.6	177.5
Debt	39.8	53.0	56.6	46.0	42.6	17.0	0	0
Turnover	37.1	73.7	76.9	95.2	80.0	101.2	250.9	327.4
Operating Profit	.7	-1.7	12.5	22.5	-6.7	5.9	116.8	179.0
Tax	0	0	0	0	0	0	4.7	77.1
Final Profit	-6.4	-9.6	5.3	12.8	-16.9	-4.4	107.7	104.6
Dividend	0	0	0	0	0	0	41.1	70.7
Debt/Capital	30%	32%	32%	27%	24%	9%	0%	0%
Op.Profit/Sales	2%	-2%	16%	24%	-8%	6%	47%	55%
F.Profit/Capital	-5%	-6%	3%	8%	-9%	-2%	48%	29%

Source: BNC Annual Reports, 1983-90

At the end of 1988 proved ore reserves of contained nickel stood at: Trojan, 15.0 kt; Shangani, 5.8 kt; Madziwa, 2.6 kt and Epoch, 4.5 kt, but total reserves (including probable and possible) are estimated at 181 kt in 24.7 Mt of ore with an average grade of 0.73% Ni. Due to reserve depletion AAC is assessing the Damba nickel deposit north-east of Bulawayo to replace concentrate from Madziwa and Epoch mines when their reserves run out. The Munali Hills deposit in Zambia has also been considered as an alternative source of feed for the smelter.

After making low profits or losses from 1983 to 1987 when the company almost went bankrupt, the group made an after tax profit of 107 MZD in 1988 and 105 MZD in 1989, due to the spectacular improvement in nickel prices. Average return on capital, after tax, for the period 1982 to 1989 was a meagre 7.2%; however in 1988 the return was 48% and 29% in 1989. During the worst financial period (1987) BNC was offered for sale to the government, which was not interested at that time, as depressed prices were expected to continue.

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 refinery at Eiffel Flats 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/annum for Centametall of Switzerland who purchase the matte from BCL, Botswana. Falconbridge Nickel of Canada have the rest of the contract of roughly 40 kt/annum which they refine at their plant at Kristiansand in Norway.

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% Ni). As the toll-refined nickel is not mined in Zimbabwe, it is not marketed by the MMCZ.

Asbestos

In 1989 Zimbabwe produced 187 kt of chrysotile asbestos, a fall of 36% from the peak of 281.4 tonnes 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 on. Due to falling world demand and prices production has fallen substantially since 1979 and from 1975 to 1987 asbestos exports fell from 9.2% to 3.8% of total exports and production fell from 6.2% to 4.7% of world output. Asbestos mining employs about 7,200 people, 16% of the total mining industry workforce, and production per worker was 27 tonnes in 1975 and 26 tonnes in 1988.

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 refers to this company as it is the only operator. Asbestos has not only suffered falling demand caused by the world recession but is increasingly being substituted for due to its perception as a health hazard in the west, but over the last few years the long fibre chrysotile (white asbestos) has been recognised as being a less dangerous variety.

All production is exported by the MMCZ via South Africa ports to buyers world-wide. A small proportion of production is consumed locally for the manufacture of asbestos cement products, also by a Turner Newall subsidiary, and in 1987 5.7 kt of asbestos-cement articles were exported. The possibility of local asbestos spinning for the manufacture of fire-proof material is under investigation.

Coal

Coal production over the 20 years 1965 to 1985 remained fairly static between 3.0 and 3.5 Mt; however, production was substantially expanded in 1986 with the commissioning of an opencast operation to supply the new Hwange Power Station, and about 5 Mt is now produced annually. Coal mining employed 9% of the total mining work force in 1988 and coal sales of 119 MZD in 1989 were 10% of total mineral production. In 1987 57.7 kt of coal and 25 kt of coke were exported, but the latter was below normal that year due to refurbishment of the coke ovens (normal coke exports are about 100 kt of coke/annum mainly to Zambia and Zaire).

Wankie Colliery Company Ltd. is a quoted company and is 40% owned by the state and 20% by AAC of SA who still provide limited technical and management services. Nearly all coal production is for the local market (95%) and in 1988/9, 45% was consumed by Hwange Power Station (HPS), 6% was consumed by the company, of which almost all was for coke production (93%), 15% was sold as coking coal, mainly to Zisco, and the rest was sold to the other thermal power stations, to farmers (tobacco curing), cement companies and households. The company has experienced severe difficulties over the past few years in supplying the local market due to inefficiencies in the national railway company in transporting the coal across the country.

Most of Wankie's coke production is exported. Zisco, who produce about 500 kt of coke per annum, consume all of their production. Byproducts from coke production are tar and benzole. A new 60 MZD distillation plant is being constructed in Kwekwe which will in future take all tar and benzole from both the Wankie and Zisco coking plants, for the production of a variety of chemical products including benzene, toluene, xylenes, napthalene, solvents and pitches, saving and generating 25 MZD of forex per year.

The company's sales for the year ended 28 Feb 1989 were 127 MZD and capital employed was 189 MZD. The average return on capital employed for 1983 to 1989 was low at 7.4%. The ratio of debt to capital

was high in the mid eighties due to the large borrowings (85 MZD) to finance the opencast expansion to supply the HPS, but has since fallen to 31% as the loans are paid off.

Table 8. WANKIE COLLIERY, FINANCIAL PROFILE (ZWD)

Year end 28:02	1983	1984	1985	1986	1987	1988	1989
Capital Employed	103.0	147.7	152.8	147.8	161.8	185.4	188.9
Assets	25.7	134.5	145.3	138.3	149.2	168.2	170.8
Debt	42.5	82.0	85.5	62.8	62.4	73.2	58.1
Turnover	47.5	56.9	74.4	93.4	113.1	108.3	126.8
Operating Profit	.8	3.8	0	17.7	21.5	17.5	18.6
Tax	0	0	0	0	0	0	0
Final Profit	2.0	3.8	4.5	17.7	21.5	17.5	18.6
Dividend	1.6	0	2.2	2.3	5.7	6.0	0
Debt/Capital	41%	56%	56%	43%	39%	39%	31%
Op.Profit/Sales	2%	7%	0%	19%	19%	16%	15%
F.Profit/Capital	2%	3%	3%	12%	13%	9%	10%

Source: Wankie Colliery Co. Ltd., Annual Reports, 1983-89

Wankie is the only coal producer at present, but as low phosphorus and sulphur coal is currently imported to supply the ferrochrome smelters, a coal deposit of this type in Sengwa is being developed by RTZ to supply 100 to 120 kt/an of coal to Zimasco in Kwekwe by a new 20 MZD road to the coalfield, financed by the government, which should be completed by the end of 1990. In addition, the National Railways of Zimbabwe (NRZ) has plans for a spur from Kadoma to Sengwa via Sanyati.

Oil-from-coal projects have been considered on and off since the 1950's and are once again under investigation, as are possibilities for coal gasification of Zimbabwe's substantial coal reserves for production of ammonia for fertilizers.

Low phosphorus and sulphur coke is also imported from South Africa for ferrochrome smelting as a suitable quality coking coal does not exist in the country. However Mozambique has a suitable coal and there is a SADCC project underway to consider the feasibility of constructing coking ovens at Moatize to supply the Zimbabwe market.

The total in situ coal reserves of Zimbabwe stand at roughly 11.1 Gtonnes. Reserves of opencast coal are estimated at 2.5 Gtonnes and reserves of underground coal at 8.6 Gtonnes. The major resource areas are: 1) the Mid-Zambezi basin: Hwange (1900 Mtonnes), Gwai River Valley (3675 Mtonnes), Binga (3604 Mtonnes), Gokwe (1150 Mtonnes) and 2) the Sabi-Limpopo basin: Sabi-Lundi (379 ktonnes), Bubye (291 ktonnes) and Tuli (127 ktonnes)[19].

Copper

Copper peaked in 1973 at 52 kt, but since then it has steadily declined to a low in 1989 of 15.7 ktonnes (-70%). Copper exports in 1987 stood at 20.9 ktonnes worth 49 MZD and in 1988 employment in copper mining was just under 4,000, 6.8% of total mining.

The large majority is produced by companies under the parastatal ZMDC, namely, MCM (Mhangura Copper Mines) and Lomagundi Smelting & Mining (LSM), with smaller amounts produced as a byproduct from the AAC nickel mines (Bindura). The Alaska smelter also takes gold rich copper concentrated from gold mines (Renco-RTZ, Jena-MTD) and about one kt/annum of copper concentrate is purchased from the Mundunguara operation in Mozambique, containing about 200 tonnes of copper.

The Zimbabwe Mining Development Corporation (ZMDC) 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 acquired copper interests fall under two local companies: MCM (ZMDC: 55%) and LSM (ZMDC: 65%). The MCM mines are Miriam and Norah and the LSM ones are Angwa and Shackleton. The Alaska smelter and refinery come under MCM. 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 MUKP, mainly from South Africa, with small amounts from the UK and local sources. Later investment, 5 MZD for the refinery in 1980, was locally generated. The mines are nearing the end of their life and current production is partly from pillar reclamation at Miriam.

The total cathode copper production of the group was 15.88 kt for the year ended 30 June 1988. Sales of gold and silver were 259 kg and 18.95 tonnes for the same period, in copper slimes from the refinery 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 recovery 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 main operating company, MCM, has not declared a dividend since its formation due to low copper prices and low grade ores. The debt to capital ratio is high, at 26%, and return on capital employed averaged a paltry 6.3% for the period 1983 to 1989, though it was a respectable 28% for the year ended 30 June 1989.

Table 9. MCM, FINANCIAL PROFILE

(year ended 30/6)	1983	1984	1985	1986	1987	1988	1989
Capital Employed	37.1	34.3	35.2	36.2	28.6	35.9	49.7
Assets	30.4	33.6	33.5	34.1	36.0	39.4	44.0
Debt	12.2	10	9.2	8.4	7.6	13	13
Turnover	41.0	46.2	36.3	51.2	47.3	71.2	105.9
Operating Profit	3.4	1.9	3.2	3.9	-4.6	6.1	17.5
Tax	0	0	0	0	0	.2	.2
Final Profit	3.4	-.6	1.6	1.8	-6.5	2.7	13.8
Dividend	0	0	0	0	0	0	0
Debt/Capital	33%	29%	26%	23%	27%	36%	26%
Op.Profit/Sales	8%	4%	9%	8%	-10%	9%	16%
F.Profit/Capital	9%	-2%	5%	5%	-23%	7%	28%

Source: MCM Annual Reports 1983-89

ZMDC is in the process of considering a new mine, Copper Queen, 90 km WSW of Alaska. The ore grades at 1.3% Cu, 1% Pb and 3.4% Zn, with significant amounts of silver. Geological reserves stand at 8 million tonnes of sulphide ore and the cost of bringing the mine into production was estimated at 32 MZD in 1985, 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 in raising the capital.

Lonrho used to own a small copper mine, smelter and refinery via Corsyn Consolidated Mines, called Inyati, which ceased production in 1988. AAC of SA's subsidiary, Bindura Nickel Corporation, produces a small amount of copper at their refinery BSR at Bindura. In 1988 951 tonnes of cathode copper were produced as a byproduct from 2.7 Mtonnes of nickel ore milled and 1.3 kt were produced from toll-refined matte from BCL in Botswana. The RTZim Base Metals Refinery at Eiffel Flats also toll-refined about 5 kt of copper from BCL matte owned by their subsidiary, Centametall of Switzerland.

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) and from there they are shipped to Europe and Japan. About 3,000 tonnes/an. of cathode copper us consumed locally by Cafca (wire and cables), Almin Industries, various copper alloy foundaries and by a copper chemicals manufacturer (Cecon).

Chromite

Chrome ore was first mined in 1906 and first exported in 1907. Production peaked in 1975 at 875.7 ktonnes before falling to a 20 year low of 431.4 ktonnes in 1983, a drop of 51%. Since then it has recovered somewhat to 627 kt in 1989, with the recovery of the world stainless steel industry. Exports of ore have fallen off rapidly from 1968 to nothing by 1984 due to the increasing off-take by the ferrochrome smelters. Presently almost all chromite production is smelted and exported in the form of ferro-chrome. In 1987 ferro-chrome exports were 242 kt worth 250 MZD, second to gold, 10.5% of total exports. Employment in chromite mining in 1988 was just under 6,000, about 10% of total employment in mining. Output per worker has fallen from 138 tonnes in 1975 to 98 tonnes in 1988.

Union Carbide Corporation's wholly-owned subsidiary, Union Carbide Zimbabwe (Pvt) Limited has a chromite mining and smelting subsidiary, Zimbabwe Mining and Smelting Company (Zimasco), which operates four mines (Shurugwe, Valley, Lalapanzi and Mutorashanga) and a smelter in Kwekwe. Chromite production rates are about 300 kt/an for Shurugwe, 70 kt/an for Valley, 35 kt/an for Lalapanzi and 20 kt/an for Mutorashanga and 70 kt/an from tributors including cooperatives, giving an annual production rate for the group of approximately 500 ktonnes. Reserves are estimated to be good for 20 years at present production for all mines except for Valley where only two more years of production are assured.

Shurugwi and Valley are on podiform deposits while Lalapanzi and Mutorashanga are on the Great Dyke stratiform deposits, but the overall ore mix from the group is such that agglomeration of the ore is not necessary for smelting, but due to increasing ore from friable stratiform deposits, both agglomeration and direct injection are being investigated.

The Zimasco smelter produces 175 kt/an of high carbon (6 to 8% C) ferrochrome from five 18 MW furnaces and one 12 MW furnace. The -1mm ferrochrome fines are remelted in a small 3 MW double crucible induction furnace. Roughly 100 tonnes/an. is sold to local foundaries. Due to high ferrochrome prices in 1988 and 1989, the company made a healthy profit, but with the current fall in prices 1990 is likely to be a difficult year financially.

Anglo American Corporation of South Africa has a local chromite mining and smelting subsidiary, Zimbabwe Alloys Limited which has four mines (Great Dyke, 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 Limited. Ore is also purchased from

cooperatives, tributors and contractors. All of 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 1990 was 79.9 ktonnes of chromite and 89.2 ktonnes of quartz; in addition, 35 kt were purchased from cooperatives and 44 kt from other sources, giving a total of 152.9 kt of ore supplied to the refinery. The refinery produced 35.9 ktonnes of low carbon ferrochrome, 49.3 ktonnes of ferrosilicon chrome, some of which is used to produce low carbon ferrochrome, 6.3 ktonnes of high carbon ferromanganese, 2.3 ktonnes of ferrosilicon 75 and 1.1.kt of charge chrome and 44 tonnes of low carbon silicomanganese.

The ferrosilicon and ferromanganese are sold to the local steelmaker, Zisco, and the ferrochrome and ferrosilicon chrome are exported. The production of calcium carbide is an experimental project for the future supply of the domestic market for acetylene and, possibly, PVC's, and a new furnace is being commissioned for this. In 1988 a new plant was commissioned to produce ultra low carbon and nitrogen ferrochrome for export to specialty consumers.

Table 10. ZIMALLOYS, FINANCIAL PROFILE.

(year end 31/03)	1983	1984	1985	1986	1987	1988	1989
Capital Employed	80.0	87.4	95.6	95.8	96.4	127.5	150.2
Assets	51.5	50.2	68.2	69.7	74.0	96.3	101.0
Debt	23.6	31.1	15.3	11.4	8.2	8.5	17.2
Turnover	46.0	76.0	78.4	78.4	107.0	138.6	169.3
Operating Profit	-.6	-1.7	19.2	16.3	17.7	25.2	53.3
Tax	0	.0	0	4.7	3.7	1.3	18.0
Final Profit	-6.7	-7.7	11.8	6.6	7.1	16.7	30.0
Dividend	0	0	4	3	3	6.3	14.9
Debt/Capital	29%	36%	16%	12%	9%	7%	11%
Op.Profit/Sales	-1%	-2%	24%	21%	17%	18%	31%
F.Profit/Capital	-8%	-9%	12%	7%	7%	13%	20%

Source: Zimbabwe Alloys Annual Reports, 1983-1989

Due to depressed world prices in the first half of the decade, Zimalloys increased its debt to capital ratio to 36% and made a loss of 7.7 MZD for the year ended 31 March 1984, but with the improvement in the world stainless steel industry, by 1989 the debt ratio had fallen to 11% and a final profit of 30 MZD was declared. The average return on capital for the period 1983 to 1989 was however only 6%. Employment at the refinery in 1989 was 1,110 and 1,360 on the mines, making a total for the group of 2,470.

Union Carbide, jointly with Zimalloys and the Ministry of Mines, has a project underway to test the feasibility of using an Eikhoff roadheader for the development of chromite mines on the Great Dyke and trials are being carried out at at Mutorashanga.

All ferrochrome marketing is done through the MMCZ mainly to North America, Japan and the EEC. About half is exported through South African ports and half through the Mozambican port of Maputo, via South Africa.

Zimbabwe has the world's largest reserves of high-chromium ores estimated at between 580 Mtonnes and three billion tonnes, the large majority of which are the stratiform ores of the Great Dyke. The latter

figure represents 84% of world high-chromium reserves. Reserves of high-iron ores are 56 Mtonnes or 5% of world reserves[20]. South Africa has over 90% of world reserves of this grade. Due to technical advances the Zimbabwean high-chromium ores have lost their premium on the world market, but ferro-chromium alloys made from it are still favoured by steelmakers.

This large resource could conceivably be an alternative to South African supplies in the event of sanctions or counter sanctions being imposed against or by South Africa, the world's largest producer. In this regard Mozambique's large hydroelectric potential at Cabora Bassa has been considered as a source of cheap electricity for the expansion of ferrochrome production. However, the likelihood of sanctions being imposed has decreased recently.

Although Zimbabwe produces all the constituents of stainless steel (ferrochrome, nickel and steel) there are no firm plans for the creation of a plant for its production. Small amounts of stainless, however, are produced on a "once-off" basis by the small foundries for stainless castings (such as geological hammers) and Zimalloys has an embryonic plan for the production of high grade stainless precision castings. The establishment of a stainless steel facility would also be important for supplying a tool making industry with its principal raw materials[21].

Iron and Steel

Iron ore production peaked in 1976 at 1.35 Mtonnes, then fell to 0.84 Mtonnes in 1982 (-38%), before recovering to 1.14 Mtonnes in 1989 when the value of production was 2.6% of total mining output. 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 almost completely state owned and started operations in 1948 at Redcliff near Kwekwe 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. Overall grade is 61.6% Fe and 0.2% Mn. However, current reserves at Buchwa are low and a major investment is being made in a sintering plant to handle the friable Ripple Creek ore which will become the principal future feed. Reserves of limonite ore at Ripple Creek were greater than 41 Mt in 1980, grading 51.4% Fe and 2.1% Mn.

Table 11. ZISCO: FINANCIAL PROFILE (MZWD)

	1982	1983	1984	1985	1986	1987	1988	1989
Capital Empl.	125.4	109.4	115.5	120.4	145.3	146.7	167.8	305.0
Assets	136.4	127.6	119.2	114.6	137.9	132.1	118.1	216.6
Debt	97.1	141.1	220.5	117.4	101.5	120.8	219.5	410.1
Turnover	93.0	106.1	112.9	167.0	237	176.8	178.8	235.5
Profit	-44.3	-62.7	-73.4	-43	-11.7	-83.8	-76.8	-53.3
Tax	.0	.0	.0	.0	.0	.0	.0	.0
Accumulated Loss	na	na	na	255.9	267.6	351.4	428.2	481.5
Debt/Capital	77%	129%	191%	98%	70%	82%	131%	134%
Acc.Loss/Capital	-	-	-	213%	184%	240%	255%	158%

Note: 1985 data is averaged as 1986 is for 18 months from 1/85 to 6/86
Source: Registrar of Companies, Harare.

Roughly 80% of iron and steel production is exported. In 1987 exports were: 283 ktonnes of ingots and billets, 86 ktonnes of bar, rods and sections, and 7 ktonnes of wire, with a total value 93 MZD. Zisco has a maximum capacity of one million Mtonnes and is at present operating at about half of this due to

depressed export markets. In 1989 Zisco had a turnover of 235 MZD on which it made a loss of 53 MZD, had an accumulated loss of 482 MZD and had a large debt of 217 MZD, necessitating an annual government subsidy. A major expansion and modernisation project is underway which includes the purchase of a new rolling mill for steel sheet from Sweden and a conversion to continuous casting of all sections. This is expected to bring the company back into profitability by 1995.

Zisco is the only integrated steelworks in the region and much of its exports are to regional customers, but the lack of a common currency and adequate lines of credit are a major limitation to the company effectively penetrating this market. A PTA/SADCC study in 1986, recommended that Zisco become the core plant supplying raw steel in a regional network of smaller (arc) smelters[22]. The advent of a democratic South Africa would pose a major threat to the viability of Zisco as the lower cost South African producers would most probably take its regional export markets.

Tin

Tin production of 848 tonnes in 1989 was 1.3% of total mineral production by value. Production peaked in 1984 at 1024 tonnes but output was reduced following the collapse of the international tin price in 1985. Employment in tin mining was 2% of total mining in 1988.

Kamativi Tin Mines Limited (KTM) 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%. In 1986 the IDC holding was transferred to ZMDC.

In 1988 KTM made an operating loss of 7 MZD on sales of 15 MZD and a final loss of 1.2 MZD after receiving a government grant. With current tin prices the operation only manages to continue on the basis of an annual government subsidy. Exports of high grade tin (99.93% "Jupiter" grade Sn) from the mine are worth about 10 MZD annually. 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 3t/month). The mine has 20 million tonnes of reserves at present prices grading on average 0.18% Sn, equivalent to about 30 years at present production rates.

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.

Apatite and Pyrites

In 1989 134 kt of phosphate rock (apatite) were produced by Dorowa Mining (Pvt) Ltd. in the Nyazura district, for their mother company, Zimbabwe Phosphates Ltd. (Zimphos), for fertilizer production. Zimphos produces single and triple phosphate (100% of local demand) after treating the ore with sulphuric acid.

Zimphos is a wholly-owned subsidiary of Chemplex Corporation which is in turn owned by AECI of South Africa, an AAC company, but the foreign (AECI) holding is expected to be bought out by the state Industrial Development Corporation (IDC), Norskhydro of Norway and Norad (Norwegian aid agency). The new company will be called the National Fertilizer Company and its explosives division will

be sold to a group made up of the IDC, Nitro Nobel of Sweden and Swedefund and will supply about 50% of the Zimababwean explosives market.

Zimphos has two sulphuric acid plants, one using iron pyrite and the other using imported sulphur. In the phosphoric acid plant, apatite (phosphate rock), reacts with sulphuric acid to give phosphoric acid and by-product gypsum. Single superphosphate is produced by reacting sulphuric acid with phosphate rock and triple superphosphate by reacting phosphate rock with phosphoric acid. In addition Zimphos produces aluminium sulphate by reacting bauxite (from Mozambique) with sulphuric acid.

Iron pyrite is mined at the Iron Duke mine near Mazowe owned by Anglo American Corporation. Output in 1989 was 47.6 kt worth 2 MZD and is all destined for the Zimphos sulphuric acid plant in Msasa.

Platinum Group Metals

Platinum Group Metal (PGM) concentrates are produced from the residue of nickel-copper refining. In 1989 25 kg of platinum and 46 kg of palladium were produced from this source but Zimbabwe has significant reserves of the PGM's in the Great Dyke estimated at 1.68 Gtonnes grading 5.54 g/ton PGM's (86%) and Au (14%) with 0.2% Ni and 0.15% Cu. RTZim ran a pilot plant on one of these deposits for several years at Zinca in the early eighties but decided not to open a mine at that time.

With the higher nickel prices in the late eighties RTZim, AACZim and Plateau Mining plc (Robertson Research) of the UK joined up on an exploration exercise to reassess both the RTZim and the AAC properties on the Hartley Complex of the Great Dyke. Plateau Mining will spend 5 MUSD on further drilling and a complete feasibility study, which will earn them 24% in the joint venture. A local company, Mhondoro Mining, has been formed to carry out the exploration. The joint venture envisages a 2.2 Mt/annum project producing a nickel-copper-PGM concentrate, containing about 2.7 tonnes of platinum, 2.5 tonnes of palladium and 4.3 kt of nickel, which will be smelted at either Bindura (AAC) or Eiffel Flats (RTZim).

Union Carbide also has PGM claims on the Wedza Complex (Mimosa) which they are reassessing for a possible platinum-nickel operation. Delta Gold of Australia has completed a detailed feasibility study of a PGM prospect on the north of the Hartley Complex for a two million tonne per year operation at an estimated cost of 420 MZD which will produce about 3 tonnes of platinum, 2.4 tonnes of palladium and 2.2 kt of nickel. Financing from a variety of sources is being sought and a final decision to go ahead with the project will be made in 1990. In addition, Cluff Minerals (UK) is exploring the PGM horizon of the Musengezi Complex on the "horseshoe" at the northern end of the Dyke.

Other Minerals

The total value of the other minerals in 1989 was 64.7 MZD or 5.4% of total mineral production. In 1989 the most important by value were: limestone (14 MZD), phosphates (12.2 MZD), silver (8.2 MZD), graphite (7.2 MZD), lithium minerals (4.3 MZD), tantalite concentrates (3.2 MZD), cobalt (2.7 MZD) and rough emeralds (2.5 MZD).

The most important of these in terms of world output, is lithium (petalite concentrate) which was approximately 7.6% of world production in 1988. All lithium minerals are produced by Bikita Minerals (Pvt) Ltd., a subsidiary of RTZ plc of the UK (50.5%), from one of the richest lithium pegmatites in the world (1.4% Li) at Bikita in the southeast of the country. Reserves in 1980 were 113.5 ktonnes of contained lithium.

Almost all limestone quarrying is for cement production at Cleveland (about 500 kt/an) and Sternblick (about 400 kt/an), and for steel production at Zisco (about 430 kt/an). Small amounts are also quarried for lime production (Early Worm Mine) and for agriculture (Springbok). Total output in 1989 was 1.37 Mt worth 14 MZD. There are also numerous other known deposits with large reserves, but none with the specific characteristics necessary for the Zimalloys ferrochrome plant which has to import about 50 kt/an of low sulphur and phosphorus lumpy lime from South Africa. Several deposits in the SADCC region have been considered in this regard, but thus far none have been found to be suitable.

Virtually all silver production, of 22 tonnes (8.2 MZD) in 1989, is a byproduct of other mining, mainly form copper and gold production. Antimony is also produced as a byproduct of gold production (Indarama) and by some small mines such as Belingwe Star. In 1989 210 tonnes worth 0.5 MZD were produced for export.

Most of the country's graphite production of 16.9 kt (7.2 MZD) in 1989, is from Zimbabwe Germany Graphite Mines Ltd.'s Lynx mine in Hurungwe District, jointly owned by ZMDC (50%) and Grafitwerk Kropfmuhl AG (50%) of West Germany. In 1988 output was 2% of the world total.

Tantalum concentrate production comes from small-scale pegmatite workings, but mainly as a byproduct of tin mining (Kamativi). Production in 1989 was 31.5 tonnes worth 3.2 MZD. Small quantities of tungsten concentrates are also produced from pegmatites such as R.H.A. mine and Richardson Kop.

Bauxite production used to come from the Alumina mine belonging to E.C. Meikle Ltd., on the eastern border, but since 1987 all production has come from the other side of the border in Mozambique. In 1989 only nine tonnes of corundum were produced, but in the mid-sixties Zimbabwe was the world's largest producers.

Magnesite production of 33.4 kt (1.4 MZD) in 1989 is mainly destined for export to South Africa, except for a small amount which is used by Sable Chemicals for the production of 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, citrine, amethyst, garnet, iolite, tourmaline, chalcedony and emeralds. The only large scale production is the Rio Tinto emerald mine, Sandawana. In 1989 6.5 kcarats of cut emeralds worth 1.6 MZD and 343 tonnes of rough emeralds worth 2.5 ZD were produced.

Kyanite production stood at 1.9 kt in 1989 from ZMDC's Ky mine in the north-east. It is consumed locally by the ferrochrome smelters as a flux and is used for the manufacture of fire assay crucibles. Talc is produced from several operations but most production comes from Manzonzo and Simon mine at the rate 1.5 kt/an for the filler and cosmetics industries.

Clay production was 105 kt in 1989 and was almost all from the Bemas and Corbut pit (for cement) and the Gwaai River Clay deposit (for ceramics). Over nineteen thousand tonnes of fireclay were produced in 1989 from the clay horizons in the lower Karoo coal measures at Wankie for the manufacture of refractory bricks by Clay Products Ltd. in Bulawayo, mainly for the steel industry. Production of kaolin in 1989 was only 17 tonnes, mainly from the Athi pit for the ceramics industry.

Mica production started in 1919, peaked in the early fifties and was virtually dead by 1960. In 1989 1.5 kt of block mica were produced, mainly by Turning Point Mine owned by Mitmar (Pvt) Ltd. 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 1989 2.7 kt were produced, mainly for the glass and ceramics industries. Vermiculite is produced for export from the James mine at the rate of about 1.5 kt/an.

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 industrialised economies.

Infrastructure

Zimbabwe most probably has the best physical infrastructure in the whole of Black Africa. It has an excellent paved and unpaved road network covering most of the country and all of the main mining areas. The railway network is well developed and most major mines are linked by rail, but over the last few years the National Railways of Zimbabwe (NRZ) has displayed an increasing inability to handle all of the rail traffic effectively, particularly the domestic distribution of coal. Government has however recently recognised the acute managerial problems at the NRZ and remedial action is being taken.

Before 1976 most mineral exports were via the Mozambican ports of Beira and Maputo, particularly the latter, but in March 1976 the Mozambican government closed these two routes in compliance with the then UN sanctions against the rebel settler regime and all mineral trade was routed through South African ports. After independence in 1980 minerals once again started flowing through the Mozambican routes but by 1984 these were once again effectively closed due to sabotage by the South African sponsored MNR bandits.

The potential instability of the southern routes has motivated Zimbabwe to attempt to make the Mozambican routes functional. The first step in this regard was the sending of troops to help guard the Mutare-Beira corridor and the second, the rehabilitation of the railway line jointly with the Mozambican Railways. Unfortunately the port of Beira's ability to handle bulk mineral cargo is limited, both in terms of the port's handling facilities and the limited tonnage of ships that can enter the port (25 kt), which is being increased by a SADCC dredging project. Maputo is more suited for mineral exports and in 1989 Zimbabwean troops were sent to guard this route as well. Some Zimbabwean minerals are exported from Maputo, but routed via South Africa.

The Zimbabwe Electricity Supply Authority (ZESA) maintains an electricity grid over most of the country including all of the major mines. Electricity costs have increased considerably to pay for the one billion US dollar Hwange power project, but are still among the lowest in the world. Over the last few years supply disruptions have become more common due to a fire at the Kafue power station in Zambia in 1989 and due to problems at the Hwange power station, but ZESA has attempted to minimise disruptions to the productive sectors such as mining.

Negotiations are well advanced with HEP (Portuguese Hydroelectric Company), who run the Cabora Bassa power station in Mozambique, for the supply of electricity to Zimbabwe. If all goes well Cabora Bassa will be linked to the Zimababwean grid at Bindura by 1994. Under the original contract 80% of the south bank power was destined for South Africa, but they have a surplus predicted until 2003 and are therefore willing to let Zimbabwe be supplied. After 2003, it is expected that the Cahora Bassa north bank station will be functional to supply Zimbabwe.

Zimbabwe has an excellent financial sector boasting several commercial banks, merchant banks, a discount house, and a thriving stock exchange. Telecommunications with the region have improved considerably with the SADCC microwave projects, and links with the rest of the world are through the new Japanese constructed satellite station in Mazowe.

The Chamber of Mines of Zimbabwe is supported by both the small and the large mining houses and represents the industry in negotiations with government.

Unlike other countries in the SADCC region, Zimbabwe has a surprisingly developed mining inputs manufacturing sector making a wide range of mining consumables. An important proportion must however still be imported, particularly heavy equipment (capital goods).

Discussion

By far the major problem for the mining industry has been and is the constantly falling real value of their products, except for precious metals/minerals, even with the increases registered in 1987 and 1988. The strong US dollar and the steady devaluation of the ZD (70% against the USD since 1980) has however meant that in Zimbabwe dollar terms the profitability of the mining companies has generally been maintained.

The next pressing problem is the acute foreign currency shortage to import essential mining consumables and equipment. In 1989 32 MZD were allocated to non-exporting mines and about 70 MZD to exporting mines which together were only 9% of the value of mineral production for that year (1195 MZD). In 1987 foreign currency allocations to the mining industry (36 MZD) amounted to only 3.4% of the value of mineral exports (1032 MZD). In US dollar terms allocations have however increased from about 15 MUSD in 1984 to about 50 MUSD in 1989.

Another crucial problem facing the mining sector has been the increase in energy costs in Zimbabwe caused by the one billion dollar Hwange thermal power project. Electricity charges increased three-fold from 1980 to 1985, but since then there have only been marginal increases for the mining industry, which consumed 35% of total power supply by ZESA in 1988/9, if the ferrochrome producers are included (18%).

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 some exports to leave via more distant South African ports, at that country's discretion. Although the port of Beira is operational, it is not suitable for bulk minerals which will go via Maputo once the Limpopo corridor is operational.

The replacement of skilled personnel is now cited by most medium to large mining companies as their most serious problem after foreign exchange shortages. There has been a steady flow of experienced staff out of the country since independence who have been difficult to replace. This problem appears to be partly overcome on most mines and plants by new graduates and in-service training, but some companies are faced with the situation where they do not have the experienced staff to train new recruits. Over the last twenty years the mines have moved away from migrant labour and currently have a permanent workforce, but this has not led to a significantly greater degree of mechanisation, due to forex restrictions on imported machinery.

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 who are steadily leaving the country. 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 of the new government's policy options.

Only a small fraction of the total value of mineral production is consumed by local industries. By far the majority is exported to the industrialised countries to be transformed into finished products, some of which will ultimately be reimported by Zimbabwe. Primary commodities, mineral and agricultural, typically constitute about 90% of total exports.

There are several projects for the further transformation of minerals in the country that have been under consideration for some time such as the manufacture of refractory bricks, the spinning of asbestos fibre, the manufacture of stainless steel from local chromium, nickel and steel and a coal-based chemical industry. But, as long as downstream transformation is only for import substitution for the local market, the primary commodities 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 exchange consumer.

The real (terms of trade) prices of Zimbabwe's primary commodities are constantly falling, even during periods of recovery in the advanced capitalist countries, forcing Zimbabwe to attempt to increase volumes to maintain essential foreign currency flows for the importation of relatively more expensive manufactures and other commodities necessary for the rest of the economy to keep functioning. Falling real prices of raw materials exports put pressure on local inputs costs to maintain profitability, especially labour costs. Low wages in the primary commodities 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 part 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 with resulting imported inflation.

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 Zimbabwe penetrating the world market for manufactures, economic integration (or collective self-reliance) in the region is the only viable method of breaking away from the present vertical integration with developed world.

A regional strategy is not only necessary in terms of an increased market for manufactures, but also in terms of utilising the larger resource base (human and material) for the development of primary industries, particularly capital goods. The SADCC region produces, or has resources of, virtually all the raw materials essential for integrated industrialisation.

Regional cooperation in metals refining has already taken place in the case of copper-nickel matte from Botswana and copper concentrates from Mozambique are 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 Zimbabwe could refine the region's gold bullion production.

But by far the most important regional cooperation by Zimbabwe with another SADCC state has been the securing of the rail and road corridors through Mozambique to the ports of Beira and Maputo and to Malawi. An essential prerequisite for the maintenance of mineral production is the provision of an operational transport system for exports.

In conclusion, Zimbabwe has a diverse and well-developed minerals sector which plays an important part in its economy both as a foreign exchange earner and as the provider of raw materials to the manufacturing and metallurgical sectors. The mining industry is also an important employer and provides a market for the local manufacturers of mining machinery and consumables. The mining sector is supported by an exceptional physical and financial infrastructure. In addition, there is a well-established manufacturing sector which is able to provide a substantial proportion of mining inputs. Due to low mineral prices, a lack of new investment and regional instability, the mining industry has not expanded since 1980. But with the current improvement in mineral prices, the stabilisation of the region and the new investment code, the Zimbabwean mining industry is poised to expand appreciably in the next decade.

Footnotes

1 Summers 1969
2 Oliver 1972, p48.
3 Tabex 1987.
4 Arrighi 1973, p336.
5 Arrighi 1973
6 World Bank 1989. It should be noted however that the smelting and refining of certain ores such as chromite (ferrochrome) and iron (steel) is classed as manufacturing while for copper, nickel and tin it comes under mining. This has the effect of inflating the size of the manufacturing sector.
7 World Bank 1989.
8 NOTE: This section draws substantialy on Jourdan 1986.
9 Much of the chromite and copper refining capacity was installed during this period.
10 The bulk of the AAC investment came from Zambia in the forties and fifties.
11 Herbst 1987.
12 Herbst 1987.
13 Personal communication with a Minerals Marketing Consultant.
14 Chamber of Mines 1973, page 113.
15 Eurequip 1987.
16 Eurequip 1987.
17 Summers, 1969, p218
18 Huffman 1974, p241.
19 Morrison 1985.
20 Slatter 1980.
21 Ndlela 1983, page 17.
22 UNIDO 1986.

The Minerals Sector of Zimbabwe

Introduction

History

The early San ("Bushman") hunter-gatherers did not possess smelting technology but did exploit fine-grained, glassy, rocks such as obsidian and chalcedony for the manufacture of stone implements and weapons. Various iron oxide ochres were also used for painting. It was not until the arrival of the Bantu-speaking iron age cultures that the mining and smelting of iron began. Ancient smelting sites, usually identified by slag heaps and tuyer shards, are to be found right across Zimbabwe, the earliest of which has been dated as the 2nd Century[1].

By the 11th Century these people had developed more elaborate forms of social organisation that also included a substantial mining and smelting industry based on other metals such as gold, copper and tin. An Arab traveller, Al Masudi of Bhagdad, visited Sofala, on the Mozambican coast, and reported a large trade in gold and ivory coming from a kingdom in the interior (Zimbabwe) at that time already[2]. From the 11th Century onwards, gold from Zimbabwe was carried by Arab and Swahili traders from the southern African coast to the Arab world and on to the Indian and Asian markets.

The construction of the spectacular stone buildings of Great Zimbabwe, at the time the largest city in sub-Saharan Africa, which took place from the 13th to the 15th Centuries, could well have been related to the dramatic increase in wealth from the thriving gold mining industry at this time. It has been estimated that there exist about 4000 ancient gold workings and about 500 ancient copper workings in Zimbabwe, Mozambique and Botswana, mainly in Zimbabwe on the Archaean schistbelts, principally dating from this period.

Under a Rozvi chief called Mutota, the Munhumutapa (meaning "pillager") Empire was built in the first half of the 15th Century and it split into two at the end of the 15th Century: the Munhumutapa in the north and the Changamire in the south. Both of these groupings controlled numerous shallow gold mines principally in the schistbelts (goldbelts) which occur right across the country.

The rise of mercantile capitalism in Europe brought the Portuguese in the 16th Century, in search of gold, copper and slaves, who sought to replace the lucrative Arab trade that had been in existence since the 10th Century. The Munhumutapa allowed their penetration in the north, but the Changamire refused them entry to the southern region.

In 1573 the Munhumutapa granted the Portuguese mining rights, for gold and other minerals, in northern Zimbabwe and Mozambique. In the late 1620's the Portuguese launched two military campaigns against the Munhumutapa state and installed a puppet Munhumutapa. At the end of the 17th Century the Changamires managed to throw the Portuguese and their puppet Munhumutapa off the Plateau and install a northern vassal kingdom[3]. The Changamires dominated the gold mining industry and gold trade, via the Sabi/Save valley to the coast, until they were routed by the Nguni (Ndebele) invasion under Mzilikazi in the 1840's, fleeing the Boer expansion into the Transvaal.

The 19th Century European explorers such as David Livingstone and Karl Mauch encountered wide evidence of the earlier thriving gold mining industry. In the 1880's the Cape diamond and gold mining magnate, Cecil John Rhodes, sent representatives to the Ndebele capital, Bulawayo, to obtain mineral concessions. In 1889 Rhodes floated the British South African Company (BSAC) and obtained a Royal Charter to install an administration over the Zambezi territories. This was done to contain the Boers south of the Limpopo and because the reputation of the Munhumutapa gold fields had led Rhodes to believe that present day Zimbabwe contained gold deposits to rival the Witwatersrand.