



THE MINERALS INDUSTRY OF TANZANIA

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# The minerals sector of Tanzania

## Introduction

### Background

Tanzania's main political party, the Tanganyika African National Union (TANU), was formed in 1954 by Julius Nyerere and it led a smooth transition to independence which was gained in 1961. In 1964 a union with the island of Zanzibar was formed which was named Tanzania. In 1967, under the leadership of Nyerere, the ruling party TANU made a dramatic commitment to socialism and self-reliance with the Arusha Declaration. The policies embodied in this declaration have officially guided the country since 1967. In 1977 the parties of mainland Tanzania (TANU) and Zanzibar (ASP) were merged to form the Chama Cha Mapinduzi (CCM) party.

Mining has long been practised by the people of Tanzania. Ferrous mining and smelting, mainly of haematite and laterite, has been carried out over the last two millenia over the whole of the country, while gold and base metal mining has been practised in selected areas (the so-called Archaean "greenstone schist belts"). Iron smelting at Ufipa was renowned right up to the time of German colonisation.<sup>1</sup> There was a rapid increase in mineral exploitation following colonial penetration by Germany at the end of the last century. After the First World War control of the country was transferred to Britain to be held in trust for the League of Nations. After the Second World War Tanganyika, as it was then called, became a Trust Territory under the United Nations, administered by Britain.

### The Economy

At independence in 1961 there were only 220 industrial establishments employing more than 10 persons with assets of more than 20,000 Tshs (1,000 UKP, 9,500 1987 USD) in the whole country and total manufacturing employment was a mere 20,000 workers.<sup>2</sup> As Tanzania was only a Trust Territory, the British directed most investment to neighbouring Kenya which was a full colony. The East African Community (EAC) was made up of Tanzania, Uganda and Kenya but most of the infrastructure and industry to service this zone was located in Kenya. The EAC finally broke up in 1977. In 1980 Arusha, in Tanzania, was the venue for the founding of the Southern African Development Coordination Conference (SADCC), which grouped Tanzania with the states to the south including the newly independent countries of Zimbabwe, Mozambique and Angola.

Table 1. TANZANIA: MACROECONOMIC INDICATORS (Tsh)

	Unit	1980	1981	1982	1983	1984	1985	1986	1987	1988
Population	M	18.5	19.1	19.8	20.4	21.1	21.7	22.5	23.2	24.0
Forex Rate	/USD	8.2	8.3	9.6	12.5	16.3	17.2	37.8	64.8	99.3
CPI (1)		100	126	162	206	280	374	495	643	868
GDP mp	G	37.5	43.9	52.5	61.0	76.3	99.3	131.3	198.1	277.8
GDP/cap	USD	248	277	278	240	222	266	155	132	121
Exports fob	G	4.7	4.8	4.3	4.2	6.1	5.7	11.0	18.5	38.4
SADCC	G	.0	.0	.0	.1	.1	.1	.1	.5	.6
% SADCC	%	.4%	.2%	.2%	2.1%	1.7%	1.3%	.6%	2.4%	1.5%
Imports cif	G	10.2	9.7	10.5	9.1	13.4	17.5	34.3	73.9	117.9
SADCC'	G	.0	.1	.2	.1	.2	.3	.5	.3	1.3
% SADCC'	%	.2%	.7%	1.9%	1.0%	1.5%	1.5%	1.4%	.4%	1.1%
Trade Balance	G	(5.5)	(4.9)	(6.2)	(4.8)	(7.3)	(11.7)	(23.3)	(55.4)	(79.5)
Debt (3)	GUSD	2.0	2.2	2.4	2.6	2.5	2.9	3.7	4.1	4.7
Debt/GDP	%	44%	42%	44%	53%	54%	50%	107%	134%	169%

Sources: Bank of Tanzania 1987/8/9, Bureau of Statistics 1987. IMR SADCC Databank 1990.

From 1980 to 1986 inflation was nearly 900%; over the same period the Tanzania Shilling dropped from 8 to the USD to 99 to the USD and exports as a percentage of imports fell from 46% in 1980 to 33% in 1988, while external debt as a percentage of GDP quadrupled from 44% in 1980 to 169% in 1988. Agriculture has always been the principal economic activity of the country and its percentage contribution to the GDP has varied between 39% and 60%. The contribution to GDP of the manufacturing sector increased more than four-fold from 1961 to the early seventies but had decreased to 8.1% in 1988.

Table 2. TANZANIA: GDP AT FACTOR COST BY INDUSTRIAL ORIGIN (%)

Year	Agr. 1	Min. 2	Man. 3	Con. 4	Trade 5	Tran. 6	Fin. 7	Pub. Ad. 8
1961	58.9	2.8	3.4	3.0	11.4	4.4	4.3	10.6
1966	45.3	2.9	9.1	3.4	12.7	7.4	9.5	10.5
1971	39.4	1.3	11.7	5.6	12.4	9.0	10.5	11.5
1976	46.2	0.6	10.9	3.4	11.4	7.8	8.7	11.9
1981	46.3	0.7	11.2	3.6	12.4	7.1	10.3	10.8
1985	58.5	0.3	6.1	1.9	13.3	6.7	7.0	7.9
1988	46.6	0.5	8.1	2.8	12.0	6.1	12.6	12.0

1: Agriculture, 2: Mining, 3: Manufacturing, Electricity & water Supply,  
 4: Construction, 5: Trade, 6: Transport/ Communications, 7: Finance &  
 Insurance, 8: Public Administration. Sources: BoT 1983/9, Bureau of Statistics 1986.

The rapid increase in both the relative and the absolute size of the manufacturing sector after independence was in part due to the extremely small starting size, but was mainly due to a concerted effort to develop this sector by the state, particularly after the Arusha Declaration of 1967 and subsequent nationalisations. Hence the share of the public sector in manufacturing value-added increased from 5% in 1966 to 39% in 1975. With declining terms of trade from the mid-seventies, the manufacturing sector contracted rapidly as increasing shortages of foreign currency for essential imported inputs cut back production, and expansion plans were shelved.

In 1986 cautious liberalization policy was embarked upon with a massive devaluation of the Tanzanian Shilling (Tshs) of 54% in an attempt to stem the worsening balance on external trade. The economic reforms also included a lessening of controls on imports and of state control of agricultural marketing. The Economic Reform Programme (ERP) has caused a rapid increase in the cost of living, five-fold since 1981, which has not been compensated for in wage increases, particularly in the state sector. The ERP has clearly benefited the rural (peasant) population more than the urban sector, as prices for their products have kept up with inflation.

## The Mining Sector

### General

The minerals sector of Tanzania is amongst the smallest in the region, though not for a lack of mineral resources. In 1988 its mining sector contributed 0.5% of GDP and in 1987 eight-and-a-half thousand people were employed by the mining sector representing 1.1% of the total formal labour force. The percentage contribution of the mining sector to GDP has declined from being small at independence to insignificant today. Average wages in the mining sector rose 41% in current terms from 1980 to 1986, but fell by over seventy percent in real (deflated) terms.

In 1959, two years before independence, the total value of mineral production was 7 MUKP (9140 MTshs) or just over 72 million 1988 US dollars, five times more than the 1988 value of output of 9.1 MUSD. In

that year diamond output contributed 62% of the total value. Up until 1945 the premier mineral in terms of value was gold, but in that year increasing output of diamonds from the operations of Williamson Diamonds Limited overtook gold in value. Since then diamonds have remained the principal mineral in terms of both the total value of mineral output and exports.

Table 3. TANZANIA: BASIC MINERAL SECTOR DATA (TShs)

	Unit	1980	1981	1982	1983	1984	1985	1986	1987	1988
GDP Mining	G	329	299	266	249	337	251	476	1137	1418
% GDP Mining	%	.9%	.7%	.5%	.4%	.4%	.3%	.4%	.6%	.5%
Mineral Prod.	M	370	207	221	273	346	363	549	815	899
Min.Prod/cap	USD	2.4	1.3	1.2	1.1	1.0	1.0	.6	.5	.4
Min.Exports	M	300	538	406	486	519	377	416	603	1632
% Mineral Exports	%	6.4%	11.2%	9.4%	11.5%	8.5%	6.6%	3.8%	3.3%	4.3%
Mining labour	k	4.3	4.3	7.2	7.6	8.3	8.6	8.9	8.5	
% mining labour	%	.8%	.7%	1.1%	1.1%	1.1%	1.1%	1.2%	1.1%	
Min.Prod/lab	USD	10515	5804	3214	2893	2544	2459	1636	1480	
avg wage/an	k	9361	7873	7959	12321	12340	12600	13170		
avg REAL wage/an		9361	6266	4912	5985	4403	3373	2662		

Sources: Bank of Tanzania 1987/8/9, IMR SADCC Databank 1990.

Following the Arusha Declaration of 1967, it became policy for the state to control key sectors of the economy including mining. Accordingly, in the early seventies, activity specific parastatals were set up such as the State Mining Corporation (Stamico) as the state holding company in the minerals sector and to spearhead mineral development in Tanzania. It immediately had transferred to it the mineral related holdings of the National Development Corporation (NDC) and other state mineral holdings which gave it a controlling equity in Williamson Diamond Mine Ltd (50%), the Diamond Cutting Co. Ltd (100%), Nyanza Salt Mines Ltd (83%), Tanzania Gemstone Industries Ltd (100%), Tanganyika Meerscham Corporation (57%) and Tanzania Portland Cement Company (100%). The last was later transferred to another state company, Saruji Corporation. Since 1973 several new companies have been acquired or set up for new operations such as Buckreef Gold Mining Company, Minjinju Phosphate Company, Songwe-Kiwira Colliery, Kahama Gold Mines Ltd and Pugu Kaolin Mines Ltd.

In 1986 the only subsidiary to declare a dividend was the Tanzania Diamond Cutting Co. Ltd which made a profit of 26.4 MTshs on a turnover of 232.3 MTshs. The total turnover of Stamico's subsidiaries was 778.8 MTshs (20.6 MUSD) of which diamond mining and cutting constituted eighty-six percent, salt made up 6 percent and all the other activities a mere 8 percent.<sup>3</sup> Stamico's impressive list of development projects appears to bode well for the future expansion of the Tanzanian minerals sector, except that many of them have been about to go into production for the last decade, and are unlikely to see the light of day in the next decade. In March 1981 Stamico published a list of six projects about to go into production which, by 1982, should have contributed 30-40 kg of new gold, 80 kt of salt, 100 kt of phosphate concentrate and an increase in gemstone output.<sup>4</sup> Even by 1988, these increases had not even marginally been realised.

A UN report in 1988, which rounded up over twenty years of UN support to the Tanzanian minerals sector and fifteen years of working with and in Stamico, had as one of its recommendations the "disbanding" of Stamico in order to concentrate meagre manpower resources on a few viable projects,<sup>5</sup> but even if Stamico is not capable of new minerals development projects, the state will still need some form of holding company to handle joint ventures with private capital and to monitor the operations, as is the function of the TPDC in the petroleum sector.

Tanzania is the host country to the Eastern and Southern African Minerals Resource Development

Centre (ESAMRDC) based in Dodoma, but with new laboratories in Dar es Salaam. The centre will provide the region with advisory services on exploration, prospecting and mining. As it is a regional facility with international funding (EEC and UNDP) the scientists receive competitive "off-shore" salaries and it will therefore be more likely to retain skills and provide a good service, unlike the Tanzanian state bodies with the same function (geological survey and mines departments) which have virtually ceased to function. <sup>6</sup>

### **Economic Geology**

The structural geology of Tanzania is dominated by the Tanzanian Shield bounded by mobile belts in the west and east and cut by the Great East African Rift Valleys. The oldest rocks are Archaean and can broadly be divided into the late Archaean (Usagaran and Ubendian) and the early Archaean (Dodoman and Nyanzian). The latter are situated on the shield, particularly around Lake Victoria and the Nyanzian rocks, which overlie the Dodoman, and constitute the well-known schist or greenstone belts which are the host rocks of most of the gold occurrences in Tanzania.

The conglomerates and quartzites of the Kavirondian System (Musoma district) rest unconformably on the Nyanzian rocks and are occasionally host rocks to gold mineralisation. The metamorphic rocks of the Usagaran System constitute a belt running north-south from Mozambique to Kenya in the centre-east of the country. This system is the source of limestones, graphite, kyanite and is cut by mica-bearing pegmatites, particularly in the Morogoro area. The highly metamorphosed sedimentary and igneous sequence of the Ubendian System are situated in a belt running north-west south-east in the south-west and west of the country and include the Mpanda Mineral Field in the centre-west of the country (Pb, Cu, Au/Ag), several titaniferous magnetite deposits (Liganga) and the Lupa Goldfield in the Rukwa Trough in the south-west of the country (Chunya).

The Proterozoic and Palaeozoic are represented by the slightly metamorphosed sediments of the Karagwe-Ankolean System in the north-east with associated mineralised pegmatites (Sn, W), followed in age by the unmetamorphosed sediments and lavas of the Bukoban System, also in the north-east. The mainly continental sediments of the Karoo System are preserved in grabens and troughs in the south-west of the country around Lake Nyasa and are economically important for their coal seams.

The Mesozoic is represented by the Jurassic and Cretaceous sediments of the coastal belt containing resources of limestone, clays, gypsum, anhydrite, evaporites (salt) and natural gas. Finally, the Quaternary sediments are important for their resources of limestone (coral), clays (kaolin), heavy mineral beach sands (Ti) and, in lake bed deposits, gypsite, phosphates, diatomite, meerschaum and soda ash.

The economically most important volcanic rocks are the diamondiferous kimberlite pipes in the Mwadui area and the carbonatites of Panda Hill (Mbeya), Oldoinyo Dili and Wigu Hill, the latter for their niobium, apatite and rare earth resources. The neogene volcanics of the Rift Valleys are of virtually no economic importance other than that they often form excellent soils for agriculture (Kilimanjaro).

### **Legislation**

Following the spirit of the Arusha Declaration of 1967, the State progressively took over the national mining industry so that by the mid-seventies the private mining sector had all but disappeared. The collapse of the minerals sector from 1967 onwards amply demonstrated that the state was not able to develop or manage this sector, particularly by their complete failure to take advantage of the rapidly rising real price of both gold and tin in the seventies. The new 1979 Act was therefore designed to allow foreign mining companies to participate with the state in the development of the minerals sector, particularly for medium to large scale mining operations.

A new Model Gold Mining Agreement was applied in 1989 which superceded the Mining Law. In the Model Agreement all royalties and taxes are negotiable. Until 1987 the state had a monopoly over the marketing of all gemstones and gold. This led to a thriving parallel market at more than double the official price. In 1987 the marketing regulations were eased in that small mines may now sell to licensed private dealers. In addition authorised operations will be allowed to retain up to 70% of their export earnings to cover essential imports.

The 1979 Mining Act caters for three kinds of licences: a Reconnaissance Licence, a Prospecting Licence and a Mining Licence. A reconnaissance licence has a specified period (up to one year), usually covers large areas and does not allow any subsurface (drilling, pitting) exploration without prior approval. It may be renewed for a second year, but confers no rights to the holder for the obtaining of a prospecting licence. A prospecting licence allows the holder to prospect for specific minerals for an initial term of up to three years after which 50% of the area is forfeited for a further two year extension. The granting of a prospecting licence includes provision for the state to acquire a majority interest in any subsequent mining operations, but under the regulations an agreement may be drawn up in which the state may guarantee not to exercise its equity rights until after an agreed time period. The section of the Mining Law that deals with the right of the state to a majority interest in any mining operation is currently under review.

When the holder of a prospecting licence discovers an economic deposit the Act gives the holder first option for the obtaining of a mining licence, on condition that he submits an acceptable plan for the exploitation of the deposit. Only a company incorporated in Tanzania may obtain a mining licence.

Under Section 15 of the Act, the Minister has wide powers to consider other systems not covered by the Act. This flexibility allows for the tailoring of regulations to fit any given investment initiative.

## Mineral Production

### General

Table 4. TANZANIA: MINERAL PRODUCTION

	unit	1970	1975	1980	1985	1986	1987	1988	1989	70-80	80-89
Calcite	kt	.00	5.39	2.86	3.55	7.36	2.90	1.65	2.51		-12%
Coal	kt	2.7	.9	6.7	7.2	5.2	2.9	3.3	46.00	152%	585%
Diamonds	Mct	.637	.479	.256	.236	.161	.113	.082	.076	-60%	-70%
Steel	kt	73.5	18.5	17.3	11.3	8.0	16.6	15.0		-76%	-100%
Gemstones	t	1.07	.04	5.75	.65	.05	4.36	9.05	11.40	436%	98%
Gold	t	.244	.000	.002	.055	.085	.201	.164	.116	-99%	5342%
Gypsum	kt	20.7	12.8	9.7	14.4	14.1	24.6	19.6	5.9	-53%	-39%
Kaolin	kt	.46	1.00	5.38	1.64	2.27	1.45	.6	1.55	1060%	-71%
Limestone	Mt	.3		1.10		.7	.68	.79	.99	218%	-10%
Cement	kt	167	266	306	376	441	489	595		83%	*94%
Meerschaum	kt	.010	.000	.000	.000	.000	.003	.000	7.29	-100%	
P, Apatite	kt	.0	.0	.0	21.0	10.0	18.4	5.0	8.32		
Salt	kt	41.9	41.7	37.0	21.1	22.1	41.1	30.0	20.00	-12%	-46%
Tin conc	kt	.162	.023	.011	.002	.008	.005	.003	.001	-93%	-86%

\* 1980-88, Source: IMR SADCC Mining Databank 1990.

In the mid-sixties Tanzania had a small but healthy minerals sector. There were numerous small mining companies and a few medium-sized ones. In 1967 there were six diamond mining concerns, 18 gold and silver mining companies which produced 2.7 tons of gold, 21 mica operations, 18 salt producers, 81 small

and medium scale tin mining operators who produced over 300 tons of concentrates, and numerous small gemstone mining operations. In that year the industry employed 9,500 people and the total value of mineral output was 183.3 MTshs or 78.5 million 1987 USD. Mineral production in terms of volume has either declined or stagnated for almost all minerals except for gold, but even gold has declined drastically compared to slightly earlier values (2.8 tons in 1965).

### *Diamonds*

Diamonds are by far the most important mineral in terms of both gross and export value, since 1945 when they replaced gold. By 1959 diamonds contributed two-thirds of the total value of mineral production, and by 1989, 68 percent.

Diamonds were first exploited near the Mabuki kimberlite pipe south-east of Mwanza immediately following the First World War. Diamonds were also exploited from a variety of gravel deposits including Usongo (Nzega) and Kisumbi and Uduhe, near Shinyanga.<sup>7</sup> In 1940 Dr J.T. Williamson started mining gravels at Mwadui, north of Shinyanga and in the fifties production from this operation averaged 350 kcarats/a increasing to 500 kcarats in 1959. Production peaked in 1971 at 971 kcarats and has steadily declined since then to 76 kcarats in 1989, down by 92 percent. A UN study on the diamond exploration potential of Tanzania, done in 1985, concluded that further kimberlite exploration would be justified and recommended that 25 known diamond-bearing kimberlite pipes in the Mwadui area should be re-sampled.<sup>8</sup>

All diamond production currently comes from Williamson Diamonds Ltd and its subsidiary, New Alamasi (1963) Ltd. The company is 50% owned by the State, through Stamico. The other half of the equity is held by Willcroft Company Ltd of Bermuda, a subsidiary of the South African diamond mining and trading giant, De Beers Consolidated Diamond Mines Ltd. The management is 100% Tanzanian, but the board is evidently 50% Willcroft nominees.

Since 1983 the Company has made a loss and by the end of 1987 the accumulated loss stood at - 251 MTshs. Recovery grades have also fallen, from 0.3099 carats/ton in 1966 to 0.0519 carats/ton in 1987, a decrease of 74%. Roughly 85% of output is gem grade. Its subsidiary, New Alamasi (1963) Ltd exploits what is essentially the same deposit at a much smaller scale (it typically produces between four and eight percent of its parent). The diamonds are sorted by the Tanzania Government Diamond Sorting Organisation (Tansort). All of the production is finally exported, but part is allocated to the Tanzania Diamond Cutting Company (Tancut) which is paid for in local currency (Tshs). All exports are done through the Diamond Corporation Tanzania Limited to the De Beer's marketing cartel, Central Selling Organisation (CSO).

A major problem is that of theft. It seems that the current diamond security structure which relies on Tanzania Government Police is inadequate and no longer effective to enforce the specialised security measures that are necessary for a diamond mine. Some diamonds therefore are lost through theft, the quantity of which is not known. In 1988 a delegation of Mwadui police was sent to Debswana in Botswana to study their security measures. The view of several outside observers is that Williamson Diamonds is the best run mining operation in the country due to good training programs in the sixties and early seventies and is now entirely managed by Tanzanians. Although Willcroft has received no return on their equity for several years, it continues to provide limited consultancy services.

In 1987 mineable reserves were estimated at 35 Mt containing 0.063 carats/t, good for only ten more years of production, and exploration for further reserves has thus far come up with nothing. The plant



is badly in need of rehabilitation, therefore the Government has exempted the company from selected taxes/royalties to allow it to invest in the rehabilitation which will allow production to continue at about 100 kcts/an.

Tancut (Iringa) was originally a joint venture between the NDC<sup>9</sup> and Belgian interests and is now owned by Stamico. Only the smaller range of stones are cut and the installed capacity is for about 900,000 small stones per annum.

### *Limestone/cement*

In 1972 Stamico inherited one operational cement plant which was later transferred to Tanzania Saruji Corporation (Saruji) in 1976 which is a parastatal specifically set up for the running and further development of the construction materials sector. There are three cement plants: One on the north coast (Tanga), one near Dar es Salaam (Wazo Hill) and one in the southern highlands (Mbeya). The total installed capacity of these three plants is 1.27 Mt/annum. All the plants use heavy fuel oil (HFO) except for Mbeya which also uses coal. It would not be viable for the Dar es Salaam and Tanga plants to convert to coal due to transport (rail) difficulties and the cost of transport. Saruji has been increasingly looking to export markets to cover their essential forex needs as they are allowed to retain 100% of forex earnings. Current export markets are Madagascar, Ruanda, Burundi, Comoros, Mauritius and, in future, Uganda. Their 1990 export target is 100 kt, out of a total production of 650 kt.

Other activities of the Saruji group include ceramics (Morogoro), sheet glass (Mbagala), container glass (Nyanza). A major constraint to glass production is the lack of a domestic supply of soda ash and cullet, which have to be imported.

Cement grade limestone deposits occur all along the coast in the belt of marine sedimentary rocks (corals) of Tertiary age and limestones of Jurassic and Cretaceous age. Suitable deposits also exist in the interior, but are much less frequent. There are three quarries under Saruji Corporation supplying a total of around 1.0 Mt/an of limestone to the cement plants at Wazo Hill, Tanga and Mbeya. A private company, Mwaweni, operates a small quarry for the production of lime in Tanga and there are artisanal lime producers (for paint, cement, agriculture) scattered throughout the country.

### *Gypsum*

Between 10 and 20 kt/an of gypsum is produced by small scale miners for the three cement plants. These operations are based around Mkomazi and Makanya (north-west of Tanga) where the small-scale operations exploit gypsite lacustrine deposits containing 60-80% gypsum. Other gypsite deposits are located at Msagali, Itigi and Mtegu. However a major rock gypsum and anhydrite resource is situated a Kilwa 20 km from the coast in the south near the Songo Songo gas field. It is a dome shaped structure penetrating limestones. The dome consists of gypsum at the top, underlain by a zone of anhydrite (to 100 m depth) followed by an unknown sequence of rock salt (to 10,000 ft). Proven reserves over a small area of the deposit were determined by Stamico to be 5 Mt containing 85% gypsum. Stamico also completed the pre-feasibility study, but currently the project is on ice. Local demand for gypsum runs at 60 to 80 kt/an, but there could also be other markets in the region.

### *Coal*

Despite Tanzania's considerable coal resources there has been virtually no exploitation until recently. A major deterrent has been that the deposits are extremely isolated, mainly in the south-west of the country. The advent of the Tazara railway in 1975 linked this area to the coast (Dar es Salaam) and opened up possibilities for coal exploitation which are just beginning to be realised. The coalfields are all of Karoo age and tend to have fairly high ash contents. The following are the main areas: 1) Ruhuhu,

2) Songwe-Kiwira, 3) Galula, 4) Ufipa, 5) Mhukuru, 6) Mbamba Bay and 7) Njuga. The development of the Ruhuhu field has been considered in the context of the Liganga iron and steel plant.

The Songwe-Kiwira Coalfield, situated at the extreme north-western end of Lake Nyasa on the Malawi border, is the most accessible of all the fields and is the only field to have been exploited, albeit at an extremely low level, at Ilima Colliery, which has operated privately for many years (about 10 kt/an) and is undergoing expansion to 20 kt/an.

The Kiwira Colliery is a new mine that was developed with Chinese assistance and came on stream at the end of 1988 with an initial production of 150 kt/an for the Mbeya cement plant, the Southern Paper Mill and to generate power for the mine, but is experiencing difficulties in securing a market for all of its output. In 1989 46 kt were produced. Reserves in the area are estimated at 33 Mt containing high ash (25% to 40%).

### *Gold and Silver*

Between 1930 and 1944 gold was the premier export worth 24 MTshs in 1940 (41 million 1987 USD). Production fell to less than half the 1941 peak of 4.4 t during the Second World War then recovered to a peak of 3.32 t in 1960 before falling off to virtually zero by the early seventies. The main reason for this decline was the fixed gold price of 35 USD/oz which in reality was declining at the rate of inflation in the United States. However, from 1971 gold went onto the open market and the price rose dramatically in real terms, almost nine-fold in the decade from 1970 to 1980 when it reached an all-time high of 27.4 1987 USD per gram.

It is apparent that gold production in Tanzania wholly failed to respond to the rapid increases in real price registered since 1970. In 1989, officially registered gold production was 116 kg. Before 1940, a significant proportion of gold production came from numerous small workers, but they could not survive the constantly falling real price of the forties, so by the fifties almost all of the production came from a few, medium scale, operations, namely Saza and Ntumbi (Lupa), Mukwamba (Mpanda), Geita and Mawe Meru (Mwanza) and Buhemba and Kiabakari (Musoma)<sup>10</sup>. Almost all of the production has come from seven well defined goldfields, namely: 1) Lupa, 2) Mpande, 3) Ruvu River, 4) Iramba-Sekenke, 5) South-west Mwanza, 6) Nzega and 7) Musoma. Areas 3) to 5) are also jointly called the Lake Victoria Goldfield.

After the closure of the mines in the Lupa field informal production took over and currently there are several thousand small-scale operators in well-established mining communities, but little of their production is registered. It is believed to be sold privately at two to three times the official price. However, from April 1990, the Bank of Tanzania started buying at the "parallel" price. One of the four proposals for funding by the UN Revolving Fund put forward in their recent study of the SADCC region was for an investigation of the Lupa Goldfield to determine reserves, at an estimated cost of 3.25 MUSD over three years.

The South-west Mwanza Goldfield (south Lake Victoria) used to be a major mining area and in the eighties the area around the old Geita and Lone Cone Mines was reappraised by UNDP which diamond drilled two prospects in the area and concluded that there were excellent possibilities for high grade mineralisation, particularly for open pit exploitation, and several mining companies have displayed interest in the area including Cluff Minerals (UK) who have open pit heap leaching operations in Zimbabwe. Several prospects in the Geita and Nzega greenstone belts will be reassessed with funding from the UN Revolving Fund for Natural Resources Exploration (UNRFNRE), which will be the first UNRFNRE funding in the SADCC.<sup>11</sup>

The Stamico Buckreef Mine is also in this area and was rehabilitated with SIDA (Sweden) aid believed to be about 11 MUSD. According to some observers it was designed and built by non gold miners using inappropriate South African technology<sup>12</sup>. Although the ore grades 5 to 8 g/t gold, much of it is in pyrite which goes to the tailings dump.

Also in the South-west Mwanza Field is the Bulyanhulu deposit, also known as Kahama, considered to be the most promising gold prospect in the country. Exploration and a feasibility study were done by Stamico in partnership with Finnish elevator manufacturer (Kone Oy). Reserves are estimated at 4.332 Mt containing 10.76 g/t Au, 12.05 g/t Ag and 0.66% Cu. The planned production rate of 150 kt of ore per annum would produce a matte containing 1.6 t of gold, 1.8 t of silver and 900 t of copper, worth, in 1988, 23.6 MUSD. Placer Dome (Canada) will invest 86 MUSD in the development of this choice prospect in 190/91 in which the state will receive an initial equity of 10% which can be increased to 35% after Placer Dome has recovered its investment, but only through the use of additional profits tax to buy equity.

The Musoma Goldfield was once the premier goldfield in the country (1930's). The main producers were, first the Buhemba Mine, and later the Kiabakari Mine. The only current operation is the retreatment of the old Buhemba dump by cyanide leaching of about 100 t/day, producing about 40 kg/annum. The reserves (dump) are estimated at about 1 Mt containing 1.5 g/t gold in pyrite. This is a demonstration operation and forms part of the Dar Tadine Tanzania (DTT) activities in Tanzania. DTT has also been involved in an experimental project with Stamico whereby DTT sends teams of purchasers into the illegal gold mining areas to buy the gold at open market prices, but this is now done by the Bank of Tanzania.

A 1988 UN assessment of the gold mining potential of Tanzania noted that one of the reasons why there had been little activity, since the new mining policy was brought into effect, was that...

"In 1984... (DTT) ...with no experience in mine development was given three year exclusive rights over areas which covered about 80% of the most attractive gold prospects of northern Tanzania. This effectively shut out other investors whilst... (DTT) ...made little effort to explore or develop its prospects".<sup>13</sup>

Small scale miners are active on all of these gold fields and it is estimated that about six tonnes of gold (bullion) is smuggled out of the country annually<sup>14</sup> as the official price is less than half the black market price. The gold is recovered by using mercury resulting in a thriving black market for mercury. In 1982/3 the Department of Mines installed two model plants to serve the small scale miners, one at Chunya (Lupa Field) and one at Buziba (Geita), but neither are operating. The idea would be for the small scale miners to bring ore to these plants for treatment.

Tanzania clearly has significant gold mining potential in all of the areas listed above. Operations ceased in most of them at a time when gold prices were at historically low levels and hence the cut-off grades that determined their closure were relatively high, in some cases as high as 6-8 g Au/t. Current gold prices are three times higher, in real terms, than the average for 1950 to 1960, and many of the closed operations would now be economically viable and warrant reassessment. The current small scale operations are only exploiting ore with visible gold. There therefore exists potential for exploiting the non-visible gold ore and refractory ore in the small scale zones. In some areas the small-scale miners' dumps run at 2-6 g/t and the rubble at 1-8 g/t and could supply the feed for a low-cost leach operation.

The new Bank of Tanzania's policy of buying directly from the miners and licenced dealers at "competitive" prices, and allowing a 70% forex retention for sellers with more than 100g<sup>15</sup> should, with

time, eliminate the black market, stimulate micro scale and small scale mining and make available about 75 MUSD/an<sup>16</sup> of forex for the further development of mining (70%) and for the nation (30%).

### *Phosphate*

Phosphates occur in three broad types in Tanzania, a) apatite (Zizi marble and Mbeya, Ngualla and Mbalizi carbonatite), b) guano (bat and bird guano) and c) phosphate in lake beds (Minjinju).

The Minjingu deposit (Lake Manyara) was first assessed in the late fifties by New Consolidated Gold Fields Ltd who delineated approximately 10 Mt of ore with an average grade of 20%  $P_2O_5$  occurring as two types, a friable (soft) phosphate containing 18.5%  $P_2O_5$ , and a hard siliceous phosphate containing 21.4%  $P_2O_5$ , in roughly equal proportions. The soft ore was readily amenable to upgrading to 28%  $P_2O_5$  by dry screening, resulting in a product suitable for direct fertiliser application<sup>17</sup>. In 1966/7 the deposit was reassessed by the Japanese Consulting Institute on behalf of the NDC and it concluded that exploitation was indeed feasible. Further work carried out in 1981 estimated 2.2 Mt of soft ore reserves.

Stamico set up the Minjinju Phosphate Company Limited to exploit the deposit and the construction of the plant (100 kt/an of concentrate) was completed by Kone Oy (Finnish) in 1983, but production only commenced on a small scale in 1984 when 14.6 kt of phosphate was produced. In 1989 8.2 kt were produced and the drop in production was attributed to a shortage of railway wagons for the long haul to the Tanga Fertiliser Plant, 500 km away. In 1987 the company's liabilities exceeded its assets by 1.0 GShs and the auditors concluded that it could not continue without external financial support. A major limitation to operating at full capacity (100 kt/an) would be the currently low capacity of the Tanga Fertilizer plant which is in need of rehabilitation. A project to this end is in the pipeline, whereupon the Minjingu operation will be brought up to full capacity.

The Panda Hill carbonatite ring complex (Mbeya) has reserves, at less than 1450m depth, estimated at 91 Mt of ore containing 3.4%  $P_2O_5$  and 0.35% Nb or 71 Mt at 4.0%  $P_2O_5$  and 0.40% Nb, but there are no plans for its development.

### *Kaolin*

There are numerous kaolin deposits in Tanzania, but most are impure and of no commercial value. The principal economic deposit is located at Pugu Hills, twenty km west of Dar es Salaam. The deposit was exploited for a few years in the early fifties by the Pugu China Clay Company Ltd (New Consolidated Gold Fields Ltd). Later, in the late seventies, it was investigated by Austroplan (Austria) funded by Austrian state aid. This study, completed in 1981, delineated 11.25 Mt of kaolin reserves in a small area. Stamico runs a small treatment plant at Pugu which was installed by a Japanese company in the early seventies as a pilot plant for the production of glass sand with kaolin as a byproduct (1.6 kt in 1989). The ADB will provide a loan for the development of Pugu Kaolin II with a capacity of 30 kt/an of high grade kaolin. The deposit is near the coast and rail, giving it good export possibilities.<sup>18</sup>

### *Tin*

All production of tin and tungsten has come from the Karagwe Tinfield, in Bukoba district in the extreme north-west corner of the country, on the Rwanda border. The cassiterite placers from pegmatites have been mined by small workers since 1924 and peak production of concentrates was reached in 1966 when 482 tonnes worth 8.8 MTshs were produced. Tungsten production from the Karagwe field came from two operations, Karugu and Chamunyana, and production of wolframite concentrate peaked in 1950 at 42 tonnes. In 1982/3 the Mines Department set up a small-scale model plant in the Kyerwa area for the local small scale operators to bring their ore to for concentration, but the shortage of water for washing the pegmatitic material has limited the effectiveness of this facility and by 1986 no ore was treated.

Magnesite deposits are fairly common in Tanzania. Production peaked in 1966 at 4.5 kt mainly from the Chambogo mine, but since 1970 production has been low (less than 1 kt/an) and erratic. There are four main magnesite areas, Chambogo and Lobolosoit; Gelai; Merkerstein Hill and Haneti and Itiso.

### *Meerschaum*

A meerschaum (sepiolite) deposit near Lake Amboseli in Masai district was discovered in 1953. The Tanganyika Meerschaum Corporation Ltd was formed to exploit the deposit and to manufacture smoking pipes. It is currently 57% owned by Stamico. From 1981 to 1989 there was no production due to the flooding of the quarry (rise of the water table) and imports of meerschaum from Somalia were resorted to in order to keep pipe manufacture going. However in 1989 7.3 kt were produced.

### *Gemstones*

Most of the gemstone occurrences are in the highly metamorphosed late Archaean gneisses, schists, marbles, granulites and charnockites of the Mozambique Belt (Ubendian). There is a particular concentration of occurrences in the north-east, south of Moshi and Arusha at Merelani and Umba. Historically a wide variety of semi-precious stones have been exploited including garnet (Namaputa, Uluguru & Ukaguru Mountains), ruby and sapphire (Umba, Morogoro), chrysoprase and amethyst (Amani, Itosa, Kilosa), moonstone (south Pare Mountains, Zoissa), kornepine (Mkata), zircon (Umba, Singida), emerald (Lake Sereri), aquamarine (Olala-Serengeti) and tourmaline (Morogoro, Mpwapwa, Merelani). Of particular interest is a gem form of clinzoisite known as Tanzanite which occurs at Merelani near Moshi.

Tanzania Gemstone Industries Ltd (TGI) (100% Stamico) was set up to coordinate all gemstone activities in Tanzania. It used to operate several nationalised gemstone mines which have since stopped producing. In an attempt to revitalise the gold and gemstone industry, the new mining policy will allow nationalised mines to be put up on tender (for privatisation) and private dealers will now be able to obtain a licence to buy providing that they sell legally.

### *Iron and Steel*

Traditional iron smelting generally used soft haematitic ores such as the bog ores at Ufipa, but these deposits are usually too small for modern exploitation. The main large resources are of titaniferous magnetite, of which there are several including Liganga, Chunya, Hundusi and Mbalala.

The Liganga is located in south-western Tanzania (Njombe district) near the Ruhuhu coal deposits and forms part of the Liganga-Mchuchuma project for steel production and as such comes under the NDC. The techno-economic evaluation study of the project was done by M/S Lurgi (FRG) in 1983/4 financed by a UNIDO grant and concluded that the project was technically and financially feasible. The project envisages that Liganga iron ore pellets will be fed into a SL/RN direct reduction plant using Mchuchuma coal to produce sponge iron with 92% metallisation, which will be rolled into steel products. Initial production capacity is planned at 0.5 Mt of steel per annum (mainly strips and plate) increasing to 1.0 Mt after the year 2000. The project will comprise: Liganga Iron Ore Mine, Beneficiation Plant, Pelletisation Plant, Mchuchuma Colliery, Coal Washing Plant, SL/RN Direct Reduction Plant, Ladle Furnace, Continuous Caster and Steel Rolling Mills. The 1987 cost of these facilities (for 0.5 Mt/an) was estimated at 715 MUSD and the supportive infrastructures at 1.1 GUSD comprising: 160 km of road (Madaba-Manda), 300 km of rail (Mlimba-Manda), thermal power plant (300 MW), townships, power transmission grid, telecommunications systems and "offsites". Over 16 years the project will save between 1154 MUSD and 1762 MUSD at 1988 prices.

Dolomitic limestone flux will come from the Msorwa/Msewe deposit which has estimated reserves of 100 Mt. The Liganga iron ore reserves are estimated at about 200 Mt with 45 Mt indicated by drilling

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containing 51% Fe, 12.8% Ti, 0.67% V<sup>20</sup>. However, the main obstacle to the realisation of this ambitious project is in the mobilising of the necessary finance which is difficult as, although the forex saving aspect is accepted, the project's ability to actually generate forex by exports is highly contentious, especially as there is already a steelworks in the region (ZiscoSteel in Zimbabwe) with a capacity of 1 Mt and which is struggling to export. Another factor against this project is the relatively short life of the mine (16 years) due to the limited confirmed reserves.

Assessment of the Itewe iron ore deposit at Chunya (Mbeya) was done by a Chinese team at the same time as an assessment of the Kiwira coalfield for a proposed steelworks (1978). Reserves have been put at 50 Mt containing 32% Fe. Mainly due to the low grade, the prefeasibility study of the project was negative. The Hundisi (western Uluguru Mountains) was investigated in 1955 and inferred reserves were put at 8 Mt containing 40% Fe, 6% Ti in a seam 10m thick, dipping at 40°<sup>21</sup>. In addition to the titaniferous magnetite deposits there are also banded manganese ironstone occurrences in the Mpanda district. At one of these, Kansanga, reserves have been estimated at 1.5 Mt of low grade (30% Fe) per metre of depth.

Aluminium Africa (ALAF, NDC), located outside Dar es Salaam, is the sole steel producer in the country. The principal activity of the company is the transformation of imported aluminium ingots (mainly from Canada, financed by aid grants). They have an aluminium sheet mill, a foil mill and an extrusion plant, but the company also has a small 10 t arc ferrous furnace made in India with a 18 kt/an capacity. It runs on scrap and local limestone flux (coral, Wazo Hill). It produces billets for castings and sheet rolling.

The capacity of the casting unit is 40 kt/an and in order to fully utilise this facility it is planned to install a second 20 t arc furnace with an annual capacity of 40 kt. At the moment billets (raw steel) are imported to supplement the output of the furnace for the casting plant, but it still operates well under capacity due to forex limitations for the billet imports.

### *Salt*

Salt has been produced from solar pans along the Tanzanian coast and from brine springs at Uvinza for centuries and, in modern times, has always been an important mineral in terms of value of output. In 1926 three thousand tonnes were sold with a value of 342 kTshs, fourth after diamonds, gold and mica, and by 1959 production had risen ten-fold to 30 kt worth 5 MTshs, fifth after diamonds, gold, lead and copper. Nyanza Salt Mines Limited (Stamico) is located at Uvinza in Kigoma District and the operation is based on the exploitation of underground brines. Sodium chloride constitutes about 91% of the dissolved solids, potassium chloride about 2.5% and the rest (about 6.5%) is made up of sulphates and chlorides of calcium and magnesium. The original capacity of the "grainer" operation was 18 kt/an. A new 60 kt/an vacuum plant built by IDECO SRL (Italy) for PVD refined salt came on stream in the second half of 1987. In addition there is a solar salt works with a capacity of 10 kt/an.

Small-scale salt panners operate all along the coastline at Bagamoyo, Dar es Salaam (Kunduchi, Temeke), Lindi and Mtwara, and are supported by the Commissioner for Mines via a team of experts who visit the villagers and advise on production methods, carry out feasibility studies and advise on purchase of equipment. The producers can get loans from the bank on the recommendation of the ministry. Production from these operations is approximately 10 kt/an.

Once all the current projects are fully operational the total national production capacity of salt should be in the order of 150 kt/an worth more than diamond production, half of which will be destined for

regional export markets (Zaire, Zambia, Malawi, Ruanda, Burundi and Uganda). The Sua Pan soda ash project in Botswana is projected to produce a surplus of 600 kt/ann of salt which will clearly limit Tanzania's development of a regional market to the south.

#### *Other Minerals*

Base metals (Cu, Ni, Zn, Pb) mainly occur in the Archaean and Bukoban rocks of Tanzania. Historically several base metals have been mined, principally from the Mpanda mineral field which is located in the centre-west of the country and from 1950 to 1960 the Mukwamba Mine, owned by Uruwira Minerals Ltd, produced about 94 kt of lead concentrates containing lead, copper, gold and silver, and was almost completely mined out by 1959. In the early seventies a Soviet team (Technoexport) reassessed this deposit and concluded that further reserves could still exist.

The Kabanga nickel deposit extends from Burundi into the Ngara district in the north-west. It is a nickel-cobalt deposit and was first surveyed by a UNDP team in the seventies. Preliminary reserves were estimated at 26 Mt at 0.7% Ni, 4.8 Mt at 1.12% Ni, and 6.0 Mt at 2.51% Ni. Thus far no interest has been shown by mining companies due to the low world market prices for these base metals until recently. At current prices this could be considered an attractive prospect for further exploration. The Zimbabwean nickel mines (Bindura Nickel Corporation) have an average grade of less than 0.7%.

Deposits of heavy mineral beach sands occur at various locations along most of the coastline containing ilmenite, rutile, zircon and kyanite. These deposits have been studied in several areas particularly the coastline between Bagamoyo and Dar es Salaam where reserves have been put at 664 kt. One of the four proposals for funding by the UN Revolving Fund put forward by their 1988 study was for an investigation of the coastal beach sands at an estimated cost of 630 kUSD.<sup>22</sup>

Tanzania has numerous scattered mica-bearing pegmatites in the Usagaran and Ubendian systems of the Archaean. They have been exploited and exported since 1902 on a small scale. The workings are generally small labour intensive operations. The main area is Morogoro along the line of rail. The region is very hilly with isolated mica pegmatites.

Tanzania possesses substantial resources of sodium salts in the brine and salts crusts of the Central African Rift salt lakes and the main resources of this type are at Lake Natron on the Kenyan border where, in the mid-seventies, the Japan International Cooperation Agency (JICA) organised a team which investigated the deposit. They estimated soda reserves to be about 136 Mt converted to sodium carbonate and concluded that exploitation was viable with a purification plant at the lake and exports via the port of Tanga<sup>23</sup>. At that time (1976) they estimated the total investment, for one million tonnes per annum, to be 320 MUSD (590 1987 USD), including plant (66%) and infrastructure (rail, port, storage, etc). Foreign exchange earnings in 1976 would have been 80 MUSD for exports of 1 Mt of purified natural soda, of which 66 MUSD would have been consumed by the operation for essential forex inputs, leaving a net forex earning of 14 MUSD. However, a SADCC study carried out in 1989 recommended that the Lake Natron deposit only be exploited on a small scale for the local market as it is extremely isolated and there are already large scale operations scheduled in Kenya and Botswana.<sup>24</sup>

Tanzania has numerous other mineral occurrences that have not been exploited because they have yet to be assessed or because they have been determined to be uneconomic or merely because there has been no organisation with the will and ability to develop them.

Uranium deposits near Tukuyu in the south in Mbeya district were surveyed by Uranus (FRG) in the early eighties, but were not followed up due to the depressed market for uranium. Bauxites have been

reported in Usambara Mountains containing 57.7%  $Al_2O_3$  and in the Western Uluguru Range. Large tonnages of good quality diatomaceous earths have been reported at Kagera in Bukoba district containing 75 to 77% silica while the development of a travertine marble deposit in Mbeya district is planned by Stamico. Scattered vermiculite deposits in pegmatites used to be worked by small scale miners in the Morogoro district, but all production has since ceased.

Tanzania possess several asbestos deposits, most of which are of the amphibole type (anthophyllite, tremolite and actinolite) rather than white, chrysotile, asbestos. Locations include Ikorongo (Musoma), Mbembe (Morogoro), Rubeho (Mpwapwa) and Haneti (Dodoma) but none have been developed due to the extremely weak market for asbestos. A low grade bentonite deposit located at the south-east end of Lake Natron was exploited in the late fifties by Industrial Minerals Ltd and there may be further resources in certain "mbugas" (wet lands) in volcanic terrains. Graphite deposits are widely distributed in metamorphosed Archaean rocks in Nachingwea District, Eastern Uluguru Mountains, Tanga District and Mpwapwa District and in the early eighties Afina Pencils Ltd mined graphite in Morogoro District for the manufacture of pencils.

One of the carbonitite complexes, at Wigu Hill south of Morogoro, is reported to have high levels of rare earth oxides and is one of the projects put forward by the recent UN Revolving Fund study for further investigation at a cost of just over one million USD.<sup>25</sup>

#### *Natural Gas and Petroleum*

There is a natural gas deposit in the vicinity of Songo Songo Island, 20 km off Kilwa-Kivinje. It was surveyed during four exploration periods, from 1975 to 1985, by AGIP, the Oil and Natural Gas Commission of India and several contractors, financed by, TPDC<sup>26</sup>, Norad, the Indian Government, the World Bank, the European Investment Bank and the OPEC Fund. Thus far nine holes have been sunk and the gas resources are estimated at 31.6 Gm<sup>3</sup>. The Kilwa Ammonia Company (Kilamco, 54% TPDC) has been set up to exploit the Songo Songo gas deposit using a standard ("off the shelf") Kellogg plant (Stamicarbon Process, NH<sub>3</sub>/Urea). Semi-commercial pledges for the plant have thus far been secured from OPIC (USA, Overseas Private Investment Corp.), IFC (WB, International Finance Corp.) and the CDC (Commonwealth Development Corp.). Export credits of 334 MUSD, from several governments and organisations, have been secured. In 1986 the funders insisted on an endorsement of the project by the World Bank. An appraisal was done in 1986/7 and it concluded the project was viable even when using the most pessimistic technological and marketing forecasts.

The proposed Kilamco (at Kilwa Kivinje) plant will produce 1560 t/d of NH<sub>3</sub> from which 1725 t/d of urea will be made, resulting in annual sales of 180 kt of NH<sub>3</sub> and 530 kt of urea. The domestic market for urea is 10 kt/an which is expected to increase to 20 kt/an once urea is freely available (5% of Kilamco output). It is planned for the Tanga fertiliser company to expand into the production of compound fertilizers which will consume 20 kt/an of NH<sub>3</sub>. The regional NH<sub>3</sub> market has been estimated at 25 kt/an. The Kilamco plant should be on stream by 1993 if it goes ahead and work starts in the first quarter of 1990.

It is estimated that the Songo Songo reserves are large enough to supply the Kilamco plant as well as utilisation in Dar es Salaam and in this respect the Italian government has already committed funds (58 MUSD soft loan) for a pipeline from Songo Songo to Kilwa Kivinje to Kilwa Masoko and the contractor (Snamprogetti) has agreed to oversize the submarine section (Songo Songo - Kilwa Kivinje) so as to be able to cater for both the Kilamco and possible future supply to Dar es Salaam.



A second gas deposit is located at Mnazi Bay in the south near Mtwara. It was also discovered by AGIP, in 1982, who relinquished the concession in 1985. Possible reserves are estimated at 600 Gft<sup>3</sup> (17 Gm<sup>3</sup>). At present there are no plans for its development.

Pre-independence (1950's) BP drilled four dry holes along the coast, but left in 1959. The first post-independence activity was 10 years later when AGIP came in to look at the coastal sedimentary basins. In the same year (1969) the Tanzania Petroleum Development Corporation (TPDC) was formed to monitor oil exploration and it also took a share in the Dar es Salaam refinery (TIPER).

In 1980 a new petroleum act was passed which more clearly established the framework for oil exploration and production. It also included safety clauses for the contractor with respect to nationalisation. All exploration by the oil majors is done on the basis of production sharing agreements (PSA's) with TPDC and government for any future production. Since the new act was passed there has been extensive exploration by Shell/Esso (Rufiji basin); the International Energy Development Corporation, BHP (Australia), Elf Aquitaine (France) and Kufpec (Kuwait Foreign Petroleum Exploration Company) all on the continental platform; Amoco (Lake Tanganyika); and Mobil Oil (Lake Nyasa). To date no oil has been struck in Tanzania. Even though most of the sedimentary basins have had some sort of exploration activity, only 19 deep holes (excluding Songo Songo) have been sunk over this vast area. There is therefore still the potential for hydrocarbon discoveries.

The Tanzanian and Italian Refinery (TIPER), located in Dar es Salaam, has a design capacity of 750 kt/ an of Iranian and/or Iraqi light crudes. Currently the refinery caters for about 60% of domestic demand for refined products and diesel and kerosene have to be imported.<sup>27</sup>

## Discussion

Unlike many of the ex British possessions to the south, Tanzania has never been a major mining country. Its potential always has, and for some time to come will, lie with its agricultural sector. Nevertheless the role that the minerals sector has played since the independence of the country in 1961 has been well below its potential, both in terms of forex generation and the production of mineral inputs to the domestic economy.

From 1961 through to the late seventies international prices for most base and industrial minerals kept pace with the terms of trade reflecting strong industrial growth and mineral demand in the OECD countries. During this period no new major mining operations opened up in Tanzania. On the contrary, many folded. From 1980 international prices fell reflecting the global capitalist crisis and possibilities for the development of new export minerals in Tanzania all but disappeared, but the recent revival of base metal prices, particularly nickel, has created new opportunities, particularly for the Mpanda and Kabanga deposits.

It is apparent that Stamico has displayed a marked inability to either keep nationalised operations running or to bring new mines into production, even during periods of buoyant prices such as those for tin from 1970 to 1985 and gold from 1972 to 1980 and, to a lesser degree, to the present. The principal problems experienced by Stamico and its subsidiaries appear to be a dearth of experienced and competent managerial personnel to both run existing operations and to get new projects operational. However, it is unclear why Stamico's performance was poor in comparison with other similar state companies such as Saruji and TPDC. How were they able to attract good managerial and professional personnel? It is possible that they were considered to be more important and were therefore allocated

better cadres (the current director of Saruji was the Stamico director for the first two years of its existence). When this question was put to the director of Saruji he emphasised the importance to Saruji of developing a strong technical and managerial support programme with a developed country (Sweden), which Stamico had not done. In addition, the national shortage of foreign currency affects Stamico's subsidiaries' ability to acquire essential operating inputs and to raise new capital for the initial investment in new projects. The new forex retention scheme for forex generators should particularly benefit the mining industry where most production is exported.

Stamico's performance for non-export (and therefore non-internationally priced) minerals for the domestic market is just as disappointing. Salt production has stagnated as has phosphate output, and although coal mining has got off the ground, markets were not secured in advance. Saruji Corporation's efforts have been much more successful and since its formation limestone and cement production have more than doubled.

The recent liberalisation policy is bound to also affect the mining sector, but to what extent the failure of the state in this sector will lead to the development of an indigenous mining sector or a TNC controlled industry (or both) is not as yet clear. Thus far the interest by TNCs has not been high, probably due to Tanzania's earlier "socialist" policies, but also Tanzania does not possess the type of large-scale, high return deposits that would interest the major mining houses, but it does have several attractive gold prospects. It also has substantial and varied resources of industrial and agricultural minerals that need to be developed to supply the local economy. But these appear to suffer from the "chicken and egg" problem in that the current demand is too low to justify investment in their development, yet at the same time demand is low precisely because of a lack of these minerals. The development of agriculture requires fertiliser minerals but the fertiliser minerals need greater demand for their development.

Tanzania also has significant gold resources and resources of various pegmatite minerals that lend themselves to micro to small scale exploitation, a scale that indigenous technology and managerial expertise can handle, possibly in partnership with small foreign concerns or, as in Zimbabwe, with support from a state technical and financial organisation.

In this regard it is hoped that the thousands of illegal gold and gemstone miners will be legalised now that the Bank of Tanzania is buying their gold at a competitive price, and by changing the mining law to give them some sort of legal tenure. Once legal, their efforts need to be supported by the state as they constitute a viable base for the development of an indigenous mining industry.

There is virtually no cooperation between the minerals sector of Tanzania and any of the other SADCC states, though several possibilities exist. The foremost would be if the Kilamco ammonia/urea plant got off the ground and started supplying the region's needs which constitute but a small proportion of its total projected output. Mozambican and Angolan natural gas resources are also being investigated for the production of ammonia/urea.

Tanzania's soda ash resources at Lake Natron could also supply certain regional imports, though the Sua Pan project in Botswana is more likely to become the regional source as plans for its development are well advanced. Tanzanian plans to penetrate the regional market for salt might also be dashed by the Sua Pan project in Botswana which will produce a byproduct of 600 kt of salt per annum, well above the regional demand.

The Pugu Kaolin deposit could substitute for current regional imports from South Africa and both Tanzania and Mozambique could supply the regional market for activated carbon from coconut shells for gold recovery.

The development of the Tanzanian gold resources could benefit from Zimbabwe's extensive experience in the mining of very similar deposits. Some of Stamico's setbacks in this regard, such as Buckreef, are partly attributable to the implementation of inappropriate technology. In this regard Tanzania could do well by first looking for partners for joint mining ventures in the region before considering foreign transnationals or dubious companies such as Dar Tadine of Switzerland/The Arabian Gulf. A Zimbabwean company has recently supplied a "low-tech" mill to a small Tanzanian gold mining company operating in the Lupa field.<sup>28</sup>

The Zambian copper giant, ZCCM, should be considered as a possible market (refinery) for the Cu/Au/Ag matte that the Kahama prospect will eventually produce if it goes ahead. The ZCCM Pb/Zn refinery at Kabwe is fast running out of lead feed from its own operations and in this regard the Mpande deposits could be reassessed as a potential source of lead concentrates.

In conclusion, Tanzania has substantial mineral potential, both for forex generation and for domestic consumption, which it has thus far failed to develop, partly due to the state monopoly in the seventies. With the changes in the mining law, private and foreign investment is beginning to flow back into the mining sector and the large "illegal" gold mining sector is being legalised.

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#### *Footnotes*

- 1 UNIDO 1982.
  - 2 Skarstein 1986.
  - 3 Stamico 1988.
  - 4 UNIDO 1982.
  - 5 UNDCTD 1988, page.
  - 6 However the geological division in Dodoma has more professionals (70) than any other survey department in the region.
  - 7 Harris 1961.
  - 8 UNDTCD 1988.
  - 9 National Development Corporation.
  - 10 Harris 1961.
  - 11 Mining Journal, 15 June 1990, page 472.
  - 12 John Hollaway & Associates, personal communication, 1988.
  - 13 UNDTCD 1988, page 11)
  - 14 Metal Bulletin, 9 April 1990, page 18.
  - 15 Mining Magazine, 162/6, June 1990, page 410.
  - 16 6 tonnes at 12.5 USD/g.
  - 17 Harris 1961.
  - 18 Jenko & Heikkila 1986.
  - 19 NDC 1988.
  - 20 Jones 1983.
  - 21 Jones 1983.
  - 22 UNRFNRE 1988.
  - 23 JICA 1976.
  - 24 MDPA- Ingenierie 1989.
  - 25 UNRFNRE 1988.
  - 26 Tanzania Petroleum Development Corporation.
  - 27 TPDC 1988.
  - 28 Peacocke, Simpson & Associates, a Zimbabwean mining support company, is aiding a small Tanzanian company, Damco, in developing gold prospects in the Lupa field.
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