

The minerals industry of Angola

By Paul Jourdan

In terms of value, the minerals industry of Angola is the largest in the SADCC, but this is almost entirely due to crude oil output. In the fifth article in our series on the mineral economies of the SADCC countries Paul Jourdan gives a background to the situation in Angola, looks at the minerals industry today and its potential in the future.

BACKGROUND

Portuguese navigators first landed on the shores of present day Angolan territory in the second half of the fifteenth century. Subsequently Luanda grew into a major trading post for goods from the interior, initially ivory, slaves and gold, and later, wild rubber, coffee and diamonds. At the Berlin Conference of 1885 Portugal formally lost control of the lucrative Zaire estuary to Belgium and their zone of influence on the south-west coast of Africa was restricted to Angola and the Cabinda enclave, but it was not until the beginning of the twentieth century that the subjugation of the interior was completed and effective control over the colony was exerted.

Artisanal mining and smelting of ferrous and non-ferrous metals has been undertaken in Angola for the last two millennia, but it was not until the early part of this century that large scale mining commenced when the financial conglomerate, Société Générale de Belgique, extended its operations from the then Belgian Congo (Zaire) to the diamond fields of north-eastern Angola, via a sister company, *Companhia de Diamantes de Angola (Diamang)*.

Recent history, 25 years of war

In 1956 a nationalist movement, the *Peoples Movement for the Liberation of Angola (MPLA)* was formed in Luanda with a view to obtaining independence from Portugal. Its early base was predominantly the urban working class and Angolan intellectuals. The expectations of the Angolan people were significantly raised from this time on by the spate of flag independencies granted by France, Britain and Belgium to their African colonies, particularly that of neighbouring Zaire.

Portuguese colonial administration was particularly backward and brutal, with the generalized use of various forms of forced labour and forced cropping. In January 1961 the forced cotton growers rebelled and in February the

MPLA made an unsuccessful attempt to free nationalist leaders from the Luanda prisons. An estimated 20 000 people were slaughtered in Luanda in the settler backlash. In March a coffee workers revolt broke out in which several hundred settlers died. In retaliation the Portuguese unleashed a reign of terror killing thousands of workers and over a hundred thousand Angolans fled to neighbouring Zaire.

In the same year some MPLA leaders retreated to the Ndembu forest 80 km from Luanda, from which they launched the first war of liberation which lasted until 1975. A second movement, the FNLA, was formed from an older tribal organization, the UPA, and from the refugees in Zaire. After the independence of Zambia and in 1966 a third movement, UNITA, was formed from a split in the FNLA, but never came to pose much of a threat to the colonial forces and, by the early seventies, UNITA had made a cease fire accord with the Portuguese on the understanding that they would try to keep the MPLA out of eastern Angola.

In 1963 the Portuguese opened up the Angolan economy to foreign investment in an attempt to gain support from the Western powers in their struggle against the nationalists. In this they succeeded to the extent that Portugal was quietly allowed to funnel NATO military equipment for use in its colonial wars. It was this policy that led to the massive expansion of the Kassinga iron ore mines with the injection of international capital (Krupp of the FRG and Højgaard & Schultz of Denmark). Exports of ore rapidly increased from 0.63 Mt in 1966 to 6.3 Mt in 1970 (900 per cent). Crude petroleum production also increased dramatically with the participation of American TNC's (Gulf Oil), from 0.54 Mt in 1967 to 8.2 Mt in 1973 (1 420 per cent). By 1973 minerals made up almost half of the total exports of the country, double that of a decade earlier.

By 1974 it had become apparent to a group of officers in the Portuguese ar-

Paul Jourdan is a Researcher at the Institute of Mining Research, Harare, Zimbabwe.
Address:
IMR
PO Box MP 167
Mount Pleasant
Harare
ZIMBABWE

my that they were slowly losing their colonial wars and that the cost to the metropolitan economy was greater than the benefits derived from the possession of an "empire". In April of that year there was a coup in Lisbon against the fascist government that had held power since the late twenties, carried out by officers from the colonial armies, the *Armed Forces Movement*, (MFA).

In January 1975 the Alvor agreement was signed in which the Portuguese Government and the three movements would make up a quadripartite transitional government until national elections in October and independence on the 11th November.

The Alvor accord rapidly broke down when, after repeated attacks on the MPLA in Luanda by FNLA (with Zairean troops) and UNITA, the MPLA retaliated, and with their overwhelming popular support in the capital city, the other two movements were thrown out. By August 1975 MPLA had established control over 12 of the 16 provinces and it seemed certain that it would lead an independent Angola after the 11th November.

The United States and its allies had always preferred the tribalist FNLA and UNITA to the socialist MPLA. The FNLA leader, Holden Roberto, had been on the CIA payroll from the early sixties. The CIA now moved rapidly to try and reverse the MPLA victories by using surrogate troops from Zaire (in the north), South Africa (in the south) and a motley collection of mercenaries, to bolster the FNLA and UNITA.¹

Armoured South African, UNITA and mercenary columns entered from Namibia (occupied by South Africa) in the south, pushing aside the poorly equipped MPLA forces. At the same time an armoured offensive of Zairean regulars, FNLA and mercenaries was launched from Zaire in the north. By the end of October the MPLA had been thrown back to a salient around Luanda as the invading armies attempted to take the capital by 11th November.

On the 5th November the Central Committee of the Communist Party of Cuba decided to send combat troops to Angola at the request of the MPLA. With the support of the Cubans and sophisticated equipment, the MPLA was able to halt and then reverse both the southern and northern offensives, despite the entry in the south of South African reinforcements on 11th November. In their headlong retreat the invading forces (particularly the South Africans) adopted a scorched-earth policy, destroying whatever might be of use to the new Angolan nation.

By 26th March 1976 the South Africans had been driven out of Angola, but the war was far from over. After their defeat the South Africans unleashed a war of destabilization against the Angolan state, undertaking hundreds of acts of sabotage, countless air raids and several full-scale invasions, as well as arming, training and supplying the logistics for UNITA to continue a guerrilla war from South African pro-

TECTED bases on the border with Namibia.

By 1978 it looked as if South Africa would be forced to end its illegal occupation of Namibia due to international pressure and in that year they agreed to the independence plan embodied in UN resolution 435. But the South Africans used every possible pretext to stall, and in June 1980 launched yet another invasion (Operation Smokeshell) of southern Angola under the pretext of hunting down Namibian nationalists (SWAPO). At the 1981 Geneva Conference on Namibia, South Africa stalled again, anticipating a change in US policy with the election of Reagan. They proved to be correct and by the end of 1981 the "Namibian problem" had become the "Angolan problem" with the USA insisting on "linkage", whereby the Cuban combat troops would have to leave Angola before the South Africans started their decolonisation of Namibia. This was in effect to continue the life of UNITA which could

Table 1
Angola: government expenditure
(in AOK¹)

	1979	1980	1981	1982	1983	1984	1985
Expenditure	57.5	76.9	91.7	72.0	67.6	82.3	90.4
Sector (per cent):							
Economic developm	36.9	34.3	47.3	36.6	26.5	26.6	26.0
Social services	16.9	17.9	15.1	20.8	21.9	21.0	20.8
Defence	26.2	19.3	16.3	20.8	34.5	35.8	38.0
Administration	10.0	11.5	2.9	19.0	13.6	11.5	10.7
Other	10.0	17.0	8.4	2.8	3.5	5.1	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note:

¹ AOK = Kwanza, Angolan national currency (see Table 2 for exchange rates).

Sources:

Bhagavan MR, *Prospects for Socialist Industrialization*, Uppsala 1986; Ministerio de Plano de Angola, *Colecta de Alguns Elementos Informativos de Situacao Socio-Economica de Angola*, Luanda, 1986; Instituto Nacional de Estatistica, *Informacao Estatistica* 1981, Luanda 1983.

not survive without the South African occupation of Namibia.

At the end of 1983, with tacit US backing, the South Africans launched an all out invasion, but it got bogged down by fierce Angolan resistance and they were finally forced to withdraw from the south of the country in 1984. In 1985 the South Africans went in again to aid the beleaguered UNITA forces at Mavinga in the south-west of the country and in December 1985 they reoccupied Angolan territory on the border with Namibia. In 1986 the USA decided to join South Africa in its support for UNITA, by openly supplying them with sophisticated military hardware.

In the north Zaire continued to support the FNLA until the Zairean guerrilla movement, the FNLC, operating from Angola and Zambia, in 1978 almost caused the collapse of the US backed Mobuto regime with an invasion of the mineral rich Shaba (ex Katanga) Province. The total disintegration of Mobuto's forces was only averted by the

arrival of French and Belgian paratroopers at Kolwezi. After this Mobuto quickly signed a "friendship" treaty with the Angolan government, but reports of Zaire being used as a rear base by anti government forces continue, even though Angola has disarmed and controlled the activities of the FNLC in its territory.

The economy

In 1975 90 per cent of the roughly 360 000 Portuguese settlers fled the country, principally because of the war, depriving the new nation of almost all its skilled technical and managerial personnel. Due to 500 years of racist Portuguese education and employment policies there were only a handful of indigenous professionals on the eve of independence. Added to this was the enormous damage to the economy wrought by the invading South Africans in 1975 and early 1976, estimated at 6.7 G USD at that time.²

The Angolan economy in 1973 was a

typical Third World economy in the sense that it was vertically integrated into the economies of the developed capitalist economies by supplying ever cheaper raw materials to them and importing relatively more expensive finished goods from them. Local industry was tiny with almost all output destined for the small settler population.

Therefore in 1976 the new socialist government was not only faced with the usual Third World problem of inheriting a satellite economy, but even this had been substantially destroyed by the second war of liberation and almost all skills had left the country. Added to this they also had to deal with a continuing undeclared war of destabilization by the RSA and USA and their surrogates (UNITA, FNLA and Zaire). From 1976 to 1981 South African damage to the economy was put at almost 1 G USD and substantial damage has been wrought by them since then.

The immediate concern of the new government was defence which accord-

Table 2

Angola: basic economic data (current G AOK)

Year	GNP	Structure of GDP (%)				Foreign trade Goods & services		
		Agriculture	Manufact & mining	Oil prod & refine	Forex rate AOK/USD	Exports	Imports	Ext debt
1980	108.51				29.92	59.32	61.04	18.42
1981	117.98				28.48	44.33	64.32	40.86
1982					30.21	40.00	47.00	
1983	125.34	11.7	7.6	26.3	30.21	49.78	51.72	
1984	139.64	9.6	8.3	29.6	30.00	61.72	64.55	68.37
1985	140.98	8.4	9.2	32.4	30.00	62.90	71.36	74.87

Sources:

Banco Nacional de Angola, Mimeo (untitled) Luanda, June 1986; Ministerio de Plano de Angola, *Colecta de Alguns Elementos Informativos de Situacao Socio-Economica de Angola*, Mimeo, Luanda, 1986; The Economist Intelligence Unit, *The Quarterly Economic Review of Angola*, No 4, 1985 and No 1, 1986, London 1985 and 1986.

ingly received the largest part of the budget and a disproportionate share of skilled cadres. Logically the second concern was to finance the war, hence resources were channelled into the oil industry, the largest foreign exchange earner. By 1985 the oil extraction and refining industry accounted for 98 per cent of exports as compared to 30 per cent in 1973 and it constituted 32 per cent of the GDP. As for the rest of the economy, large sections were nationalized in the wake of settler abandonment while other sectors virtually collapsed.

From 1981 to 1985 the allocation for defence doubled from 16 per cent to 38 per cent of the state budget, an expense that the battered economy could ill afford. Most of this increase was accounted for by a 45 per cent drop in investment in "economic development", from 47 per cent to 26 per cent over the

same period. With the decline of the manufacturing and agricultural sectors the Angolan economy has become increasingly dependent on the minerals sector, particularly the oil industry.

THE MINERALS INDUSTRY

The minerals industry of Angola is, in terms of value, the largest in the SADCC, but this is almost entirely due to crude oil output. Table 3 gives Angola's relative position in the SADCC grouping in 1983. In that year it constituted 12 per cent of the total SADCC population and 25 per cent of the area, making it, after Botswana, the second least densely populated. Its GNP was 20 per cent of the total, resulting in a GNP/capita 55 per cent higher than the SADCC average, while it had 18 per cent of the regional debt.

In terms of minerals, Angola accounted for 43 per cent of the total value of minerals produced in the region and the minerals industry contributed 26 per cent of the country's GDP, 163 per cent higher than the SADCC average, second only to Botswana (28 per cent). Mineral exports were 96 per cent of total national exports or 57 per cent above the regional average, with Zambia, the highest in the region.

Due to its clear leadership in petroleum exploitation and refining Angola is the coordinating country for the SADCC energy sector which has its HQ in Luanda.

Regarding exports, Table 4 displays the dramatic increase of mineral export dependence. From 22 per cent in 1963 to 47 per cent in 1973 to 96 per cent a decade later in 1983, more than a four-fold increase in 20 years. At the same

Table 3

SADCC: basic economic and mineral data, 1983 (USD)

SADCC states	Area k-km ²	Pop'n Mil	GDP G USD	The economy			The minerals industry			
				GNP/ cap	Debt G USD	Exports M USD	Prod'n M USD	% GDP	% Exp's	% ¹ Employ
Angola	1 247	8.2	4.18	506	2.11	1 572	1 646	26	96	9
Botswana	600	1.0	0.89	833	0.21	611	590	28	75	27
Lesotho	30	1.5	0.35	460	0.15	47	19	1	41	9
Malawi	118	6.6	1.33	210	0.72	220	7	0	0	1
Mozambique	799	13.2	1.70	130	1.66	132	5	1	2	1
Swaziland	17	0.7	0.50	870	0.20	271	23	3	5	3
Tanzania	945	20.8	4.55	240	2.58	566	45	2	8	2
Zambia	753	6.3	3.35	580	2.64	869	1 040	15	96	16
Zimbabwe	391	7.9	4.73	740	1.50	1.133	470	11	61	6
Total (avg)	4 900	66.2	21.58	326	11.77	5 421	3 845	11	61	
% Angola²	25	12.4	19.37	155	18	29	42.8	263	157	

Notes:

¹ % Angola of SADCC total or SADCC weighted average.

² % total formal employment.

Sources:

SADCC Mining Sector, *Analysis of Mineral Resources Development and Opportunities in the SADCC Region*, Lusaka, 1985; and SADCC Government Data.

time there has been an increasing dependence on one mineral, oil. In 1963 oil accounted for 13 per cent of mineral export, in 1973 64 per cent and by 1983 oil and oil products constituted 94 per cent.

Due to the security situation the variety of minerals produced has shrunk dramatically (Table 5), although the value has increased due to the relatively "bandit free" nature of off-shore oil production. However, in May 1985 South Africa did attempt to sabotage the installations in the Cabinda enclave. Diamond production has continued, but since 1980 output has halved, mainly due to bandit activity (Table 5). The only other significant mineral production is quarrying for construction materials such as limestone, gypsum and granite (Table 5).

At the 1977 and 1980 MPLA Congresses a fundamental mineral policy

was formulated in which priority was given to petroleum, diamonds, iron ore, phosphates, ornamental stones, underground water and copper exploitation "... with a view to creating a balanced economy and conditions capable of generating the necessary surpluses for export".³ This concentration on relatively few minerals (relative to Angola's resources) was in part due to the dearth of skilled mining personnel available after the settler exodus of 1975.

The minerals industry comes under two separate ministries: The Ministry of Energy and Petroleum, which owns the state oil company, Sonangol, and the Ministry of Industry. The Mining Law of 1979 created, under the Ministry of Industry, the National Directorate for the Mining Industry with its research arm, the National Institute for Geology

(ING, Geological Survey Dept) and the National Department for Mines which controls several state mining companies (Endiama, Ferrangol, Roremima, Mina-quartzo and Fosfang).

A revision of the Mining Law is being drafted. This will bring it more in line with the Petroleum Law in that foreign participation (for production sharing) at the early stages of exploration and feasibility studies will be encouraged for projects that will be mainly export oriented. This is being done because, at the present time, the state does not have the capacity for an expansion in exploration activity. Under the present law only the state, via the ING, can carry out mineral exploration.

Petroleum

Exploration started in 1910 in the Congo and Kwanza basins and in 1915 the

Table 4

Angola: principal exports, 1963, 1973 and 1983
(current G AOK)

Commodity	1963			1973			1983		
	Vol	Val	% total exports	Vol	Val	% total exports	Vol	Val	% total exports
Diamonds Mcts	1.29	0.77	16.2	2.11	2.00	10.4	1.30	2.66	5.6
Iron ore Mt	0.66	0.14	2.9	6.33	1.21	6.3			
Crude oil Mbbl	0.32	0.13	2.7	7.32	6.76	30.1	54.85	40.18	84.6
Oil prods Mt							0.50	2.66	5.6
Total minerals (%)			21.8			46.8			95.8
Coffee kt	136.44	1.89	40.0	213.41	5.08	26.5	45.00	1.85	3.9
Sisal kt	62.98	0.58	12.2	53.40	0.47	2.4			
Fish kt	39.33	0.15	3.2	112.98	1.36	7.1			
Other		1.08	22.8		3.28	17.1			0.3
Total exports (G AOK)		4.74	100.0		19.15	100.0		47.49	100.0

Sources:

British Geological Survey, *World Mineral Statistics, 1971—1983*, London, 1985.

Ministerio de Plano de Angola, *Colecta de Alguns Elementos Informativos du Situacao Socio-Economica de Angola*, Luanda, 1986.

first well was sunk in the Kwanza basin. The basins are typical of the passive margin type, associated to continental drift. Most of the reserves (Cabinda) are of lower Cretaceous (Albian) and Upper Jurassic age. A significant salt layer divides the sequence from rift type to continental margin type and serves as the important cap rock for the petroliferous sediments below. The crude is basically a good quality light (about 36 degrees API, 0.8 SG) but can be extremely variable.⁴

Production and reserves

In 1958 production was 58 Mt from Kwanza and subsequently started up in the Cabinda and Congo basins. From 1968 to 1969 production jumped 224 per cent from 752 Mt to 2434 Mt and replaced coffee as the country's premier export. By 1973 production had increased 236 per cent (relative to 1969) to 8 175 Mt, 90 per cent from the Cabinda basin (off-shore), 7 per cent from the Kwanza basin (on-shore) and 3 per cent from the Congo basin (on-shore).⁵ Production

from the latter two basins peaked in 1974 at 172 kbbl/day and has since been on the decline as the reserves are diminished⁶ while both the reserves and production from the off-shore fields (Blocks 0, 2 and 3; see map) has been on the increase. In mid-1986 both production and reserves were double that of a decade earlier and reserves are presently estimated to be good for ten years at present production rates. From 1975 to 1985 the rate of reserves discovery was twice the extraction rate.⁷

Table 5

Angola: mineral production (volume)

Mineral		1973	1980	1981	1982	1983	1984	1985	% change	
									73-85	80-85
<i>Mining:</i>										
Asphalt	kt	49.6								
Beryl	t	115.0								
Gypsum	kt	92.2	na	na	na	na	na	na		
Diamonds	Mcts	2.1	1.5	1.4	1.2	1.0	0.9	0.7	-66.0	-51.7
Gold	kg	0.5								
Granite	k-m ³	8.0	1.3	1.4	1.6	1.4	0	0.5	-93.6	-59.4
Iron Ore	Mt	6.0	0	0	0	0	0	0		
Kaolin	kt	0.7								
Limestone	Mt	9.0	na	na	na	na	na	na		
Manganese	kt	6.2	0	0	0	0	0	0		
Marble	k-m ³	1.5								
Oil (crude)	Mbbl	58.7	49.7	47.4	47.6	65.2	74.7	84.4	43.8	69.8
Quartz	kt		1.8	1.1	0	0	0	0		
Salt	kt	96.7	23.8	38.9	21.9	7.9	0	6.0	-93.8	-74.8
<i>Refining:</i>										
Cement	kt	767.7	253.0	243.5	175.5	125.0	126.4	205.0	-73.3	-19.0
Steel rod	kt	35.7	3.6	2.7	1.7	2.3	1.8	4.1	-88.5	14.2
Oil prods	Mt	6.6	1.2	1.2	1.0	1.2	1.2	1.4	-79.0	19.0

Notes:

¹ Natural bitumen; blank space = no data, na = not available.

Sources:

Dilolwa CR, *Contribuicao a Historia Economica de Angola*, Luanda, 1978; Instituto Nacional de Estatistica, *Anuario Estatistico 1973*, Luanda 1974; Ministerio da Industria de Angola, Mimeo, Luanda 1986; Ministerio de Plano de Angola, *Colecta de Alguns . . .*, Luanda, 1986; Sonangol, "Sonangol", Luanda 1985.

Production in 1985 was 84.7 M bbl (11.6 Mt) and the production rate is at present roughly 230 kbbbl/day. This will increase to about 250 kbbbl/day (91 M bbl/year) at the end of 1986 when production from Block 3 comes on stream.

Exports

In 1984 exports of oil and oil products were worth 55.5 GKw, 92.8 per cent of total exports,⁸ and increased significantly in 1985 (to 77.8 M bbl of crude), but earnings have dropped substantially

due to the collapse of the international oil price. Angola expects a loss of 600 M USD in export earnings in 1986 due to the low price. In response the Government has announced austerity measures and reduced import quotas for 1986. Production though, will continue to expand as the cost is roughly 5 USD/bbl, still well below the international market price.⁹

Table 6 gives the real value of Angolan oil exports indexed to 1975. If the oil price averages 10 USD/bbl for

1986 and exports are 75 M bbl, the real value of oil exports will be 68 per cent of the 1975 value, even though the volume of exports has increased 140 per cent over the same period and the real unit value of oil exports will have fallen to a half of the 1975 value (Table 6).

Companies

Pre-independence, the main companies were: in Cabinda, *Cabgoc* (Cabinda Gulf Oil Company) owned by Gulf Oil of the USA; in Kwanza, *Petrangol*, 30

Table 6

Angola: indexed (1975 = 100) value of crude oil exports

Year	US GNP deflator	1975=100	Crude oil price USD/bbl	Indexed USD	Angolan exports Mbbbl	Indexed value of exports
1970	91.45	137.23	1.3	16.37	31.29	9.62
1971	96.00	130.73	1.7	20.39	34.80	13.33
1972	99.98	125.53	1.9	21.88	50.06	20.57
1973	105.68	118.75	2.7	29.42	53.68	29.66
1974	114.95	109.18	11.2	112.18	54.24	114.29
1975	125.50	100.00	10.9	100.00	53.24	100.00
1976	132.10	95.00	11.7	101.98	31.15	
1977	140.03	89.62	12.8	105.25	55.50	109.71
1978	150.35	83.47	12.9	98.79	37.10	68.84
1979	163.40	76.81	18.6	131.06	42.90	105.61
1980	178.43	70.34	30.5	196.81	40.90	151.19
1981	195.60	64.16	35.6	209.56	38.14	150.12
1982	207.40	60.51	31.4	174.48	39.26	128.67
1983	215.30	58.29	27.8	148.83	54.85	153.33
1984	222.90	56.30	27.2	140.71	64.16	169.57
1985	230.00e	54.80	25.9	129.65	72.82	177.34
1986	237.00f	53.63	10.0f	48.58	75.00f	68.44

Notes:

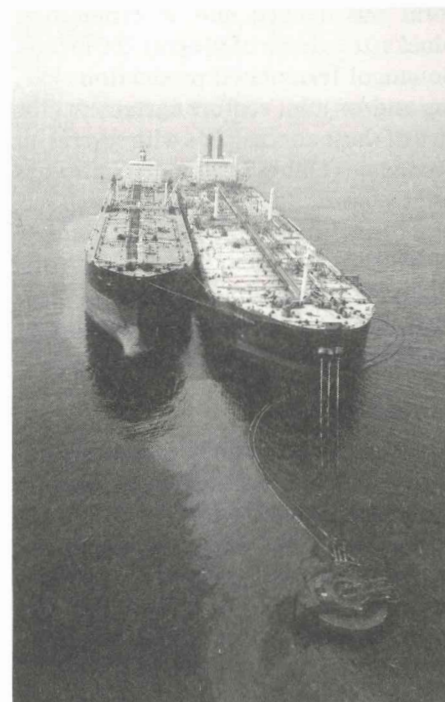
e = estimate, f = forecast.

Sources:

British Geological Survey, *World Mineral Statistics 1979—83*, London 1985; Dilolwa CR, *Contribuicao . . .*, Luanda, 1978; Sonangol, "*Sonangol*"; Luanda 1985, World Bank, *Commodity Trade and Price Trends*, John Hopkins University Press, London, 1982.



300 000 Dwt VLCC storage tanker off Cabinda. Further tanker loading to starboard.



per cent owned by the colonial state, but controlled by Petrofina of Belgium and, in the Congo Basin, there were a variety of companies including Petrangol, Angol (Portuguese), Texaco (USA) and Total (French).

The state oil company, *Sonangol* (Sociedade Nacional de Combustiveis de Angola), was formed in 1976 and under the Petroleum Law of 1978 (law 13/78) Sonangol became the exclusive concessionaire for hydrocarbon exploration and production. It acquired the operations of Angol (Portuguese) and entered into a series of joint ventures and production sharing agreements with the oil transnationals. By 1984 Sonangol owned approximately half of Angola's oil production (Table 7).

During 1977-78 Sonangol became a 51 per cent participant in an off-shore Cabinda joint venture with Cabgoc (Gulf Oil, now owned by Chevron) in which production is shared at a 51:49 ratio. Sonangol also has joint venture operations in the Congo and Kwanza basins with Texaco and Petrofina (Table 7).

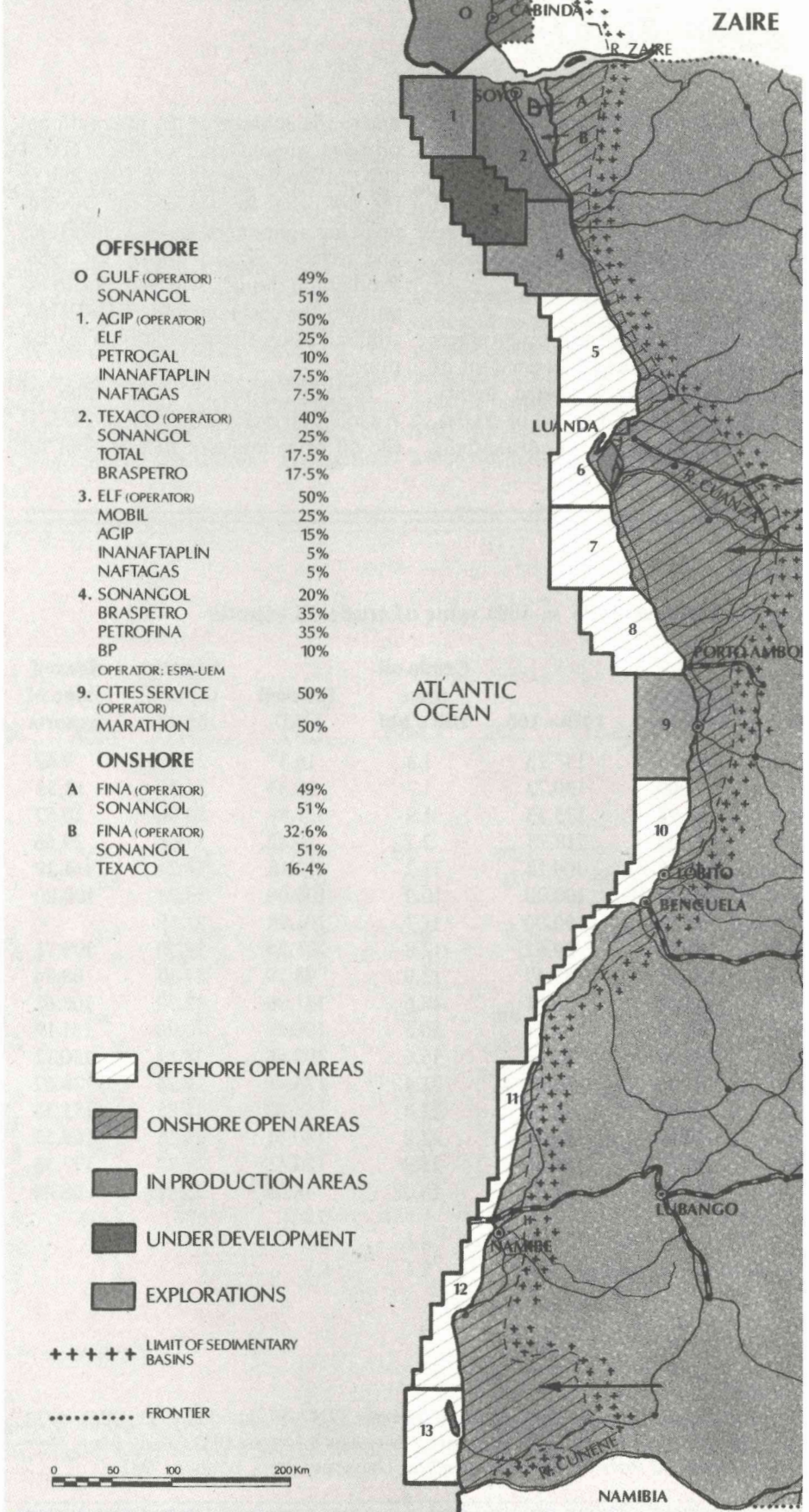
In 1978 the Angolan continental platform was divided into 14 exploration blocks (to a depth of roughly 200 m) and Sonangol formulated production sharing and/or joint venture agreements for five of these concessions with several oil companies (Table 7). Sonangol also has joint ventures for companies which service the petroleum industry, an example of which is Petromar which builds off-shore oil installations, submarine pipelines and port facilities, at the port of Ambriz (north of Luanda).

Investment

An extensive program of investments in the oil industry has been undertaken by Sonangol. From 9 M USD in 1977 to 176 M USD in 1982¹⁰ and total investment in the hydrocarbon industry for 1986 is projected at 756 M USD,¹¹ but this might be cut back, due to the low international market price for oil.

Some of the recent major investment

ANGOLAN EXPLORATION & PRODUCTION AREAS 1984



projects have been: gas injection facilities at Cabinda, the development of the Takula field, the development of the Kungula, Kambala and Livuite fields (off Cabinda), the construction of the Kwanda oil field service base, the development of the Quinquena, Quinguila, Essungo and Cuntala fields and the construction of the Quinquena oil terminal, near the mouth of the River Zaire. The Cabinda gas injection project has also made available about 733 kbbl/year of liquid petroleum gas (LPG) for export¹³. Investments have also been made in the domestic fuel distribution system, agricultural projects (farms and cattle rearing), housing, air transport and oil in-

dustry equipment manufacture (Petro-mar) mentioned above¹³.

Finally, a major concern of the MPLA government is manpower development and considerable investments have been made by Sonangol in this field, including the creation of an oil industry training centre in Cabinda (Malongo), the training of technicians overseas and the legal (contractual) obligations of the oil TNCs to develop local manpower¹⁴. As the coordinator of the SADCC energy sector, Angola has created a regional training centre at Sumbe.

Processing

In 1958 a small refinery (2 kbbl/day)

refinery was opened in Luanda by Petrangol (Belgium) and in 1972/73 it was substantially expanded to refine 30 kbbl/day (1.5 Mt/year). It is a hydro-skimming refinery primarily for the production of LPG gasoline, jet fuel and gas oil for the domestic market. At present the product mix of the refinery is not compatible with Angolan consumption and some petroleum products still have to be imported (10 kt in 1984). The refinery is at present running at close to full capacity and will shortly be expanded and optimized with a joint Portuguese-Italian investment project¹⁵.

In 1982 two feasibility studies for the establishment of an ammonia plant bas

Table 7

Petroleum production and exploration areas

Area	Joint venture		Operator	Area	Production sharing		Operator
	Owners	%			Owners	%	
Cabinda	Sonangol	51	Cabgoc	Block 1	Agip	50	Agip
	Cabgoc	49			Elf	25	
Soyo	Sonangol	51	Petrofina	Block 3	Naftagas ²	15	Elf
	Petrofina	32.6			Petrogal	10	
	Texaco	16.4			Elf	50	
Soyo	Sonangol	51	Petrofina	Block 9	Agip	15	Cities
	Petrofina	49			Mobil	25	
Kwanza	Sonangol	51	Petrofina	Block 9	Naftagas ²	10	Cities
	Petrofina	49			Cities	50	
Block 2	Sonangol	25	Texaco	Block 9	Marathon	50	Cities
	Texaco	40					
	Total	17.5					
	Braspetro	17.5					
Block 4	Sonangol	20	ESPA-UEM ³	Block 9	Marathon	50	Cities
	Braspetro	35					
	Petrofina	35					
	BP	10					

Notes:

¹ See Map for concession areas.

² Naftagas plus Inanaftaplin.

³ Sonangol is part-owner of ESPA-UEM.

Source:

Sonangol, 1985.

Map of Angola showing provinces, provincial capitals and the diamond mining centres.



ed on natural gas were undertaken by Arthur D Little (UK) and the International Gas Development Corporation (USA) and in 1984 a regional (SADCC) fertilizer market survey was undertaken by Cramer and Warner (UK) funded by the *Commonwealth Secretariat (CFTC)*. These studies resulted in a proposal for the construction of a plant to produce 1 100 t/day of ammonia and 1 800 t/day of urea, at a cost of roughly 500 M USD. It is planned to locate the plant near Soyo in the extreme north-west of the country, close to Blocks 1, 2 and 3, the source of the gas. The gas reserves are considered good for the life of the plant (20 years).

Soyo is only 80 km north of the Kin-donocaxa phosphate deposit and the possibility of establishing an integrated phosphate/urea fertilizer plant is under consideration. The production of PVC from propane in the gas of Blocks 3 and 4 is also being investigated as part of the ammonia project. At present, finance for the project is being sought from south-east Asian companies, specifically South Korean (a consortium led by Daiwo Corp), in which the backers would take the majority of production as the regional (SADCC) market represents only 10 per cent of projected output.¹⁶

Asphalt

Angola also has reserves of asphaltic rocks in the Cabinda basin, the Congo basin (Gondo and Musserra) and the Kwanza basin (exploited in the past). In Angola the name "libolite" has been given to natural bitumen (tar) as a large deposit occurs at Libolo near Kwanza. Deposits of "libolite" are also found at Kilundo, Kirimbo and Porto Amboim. Between 1948 and 1973 roughly 810 kt (30 kt/year) of asphaltic rock were produced with a bituminous content of 18 to 22 per cent, principally for road surfacing. Exploitation of this resource has ceased as the output of bitumen from the refinery covers local needs at present.

The deposits were considered for refining into petroleum products but the cost was well above market prices for the products.¹⁷

Diamonds

The first systematic prospecting for and exploitation of diamonds in Angola was by *Companhia de Pesquisas Mineiras (Pema)* in the northeast of the country (Lunda) in 1913. In 1920 this was taken over by *Companhia de Diamantes de Angola (Diamang)* which was owned by *Soci t  G n rale de Belgique (SBG)* 18 per cent, Portuguese financial concerns 16.4 per cent, the Diamond Corporation (De Beers) 1.7 per cent and the public (mainly Portuguese), 49 per cent¹⁸.

In 1922, Oppenheimer of Anglo American managed to secure the selling rights for all of Diamang's production as part of his international bid to control the diamond market and thereby get control of De Beers, the largest producer. In 1929 Anglo American took over De Beers and Oppenheimer became Chairman and in 1934 the Diamond Producers Association was formed, dominated by De Beers, which to this day has a virtual monopoly over

diamond marketing via the Diamond Trading Company and its *Central Selling Organization (CSO)*.

Until 1964 all of Angola's official sales were to the CSO in the UK, but from that year a proportion of the most valuable diamonds went directly to the *Sociedade Portuguesa de Lapidacao (Dialap)*, paid for in Portuguese escudos rather than UK pounds.

Diamang had exclusive exploitation rights over 81 per cent of the country and maintained a "state within a state"¹⁹ particularly in Lunda district where it ran its own police force, administered justice, maintained a standing army of mercenaries and was responsible for agriculture, health, education, etc. Contrary to the migrant mining labour supply systems common in the rest of southern Africa, Diamang encouraged the formation of a permanent labour force which stood at 24 801 in 1973.

In 1971 Diamang ceded most of its diamond exploration and mining rights (except for the Lunda and Kassanje areas) to *Concorcio Mineiro de Angola (Condiam)*, a local prospecting arm of De Beers, 45 per cent owned by De

Beers, 45 per cent by Diamang and 10 per cent by the Angolan colonial state.

Exports and production

From 1950 to 1957 exports ran at between 700 and 800 kcts/year, representing from 7 and 13 per cent of total exports by value. From 1958 exports steadily increased to a peak of 2 503 kcts in 1970 (19 per cent of total exports) before falling to 2 111 kcts in 1973 (10 per cent of total exports: see Table 8). It should be borne in mind, however, that these figures are for "official" exports. A significant proportion of production has always been smuggled (up to 50 per cent).²⁰

In 1973 60 per cent of Diamang's output was gem grade and 40 per cent industrial grade, a gem-to-industrial ratio that was only bettered by Namibia (CDM). In that year there were 45 open pit alluvial diamond workings in Angola.

After independence production fell to 340 kcts in 1976, 84 per cent down on 1973 (2 125 kcts). It then steadily rose to 1 500 kcts in 1980 as the country recovered from the second war of liberation, before falling to 717 kcts in 1985 due to the deteriorating security situation. In 1981 diamonds accounted for 12 per cent of exports, but this had fallen to 3 per cent by 1984, due both to a fall in the world market price and to a drop in output (Table 8). At present the grade of production is running at greater than 90 per cent gem quality²¹.

Companies

The state diamond company, *Empresa Nacional de Diamantes de Angola* (Endiama), was created after the passing of the Mining Law of 1979 and is responsible for diamond prospecting, mining, processing and marketing. Endiama holds the 70 per cent Angolan State share of Diamang. Diamang is in turn part owner of Dialap in Portugal (25 per cent) and Condiama (45 per cent, now inactive) and runs all diamonds mining in Angola. The main mining areas are Lucapa, Cassanguidi, Andrada, Maludi, Cuanga and Calondo, all in the north-eastern part of the country. All the mines are open pit alluvial workings using heavy medium separation.

Until the end of 1985, an indirect subsidiary of De Beers, *Mining and Technical Services* (MATS) of the UK, was providing administrative, technical and marketing services to Diamang, but the contract has not, as yet, been renewed. Since then MATS' functions have been carried out by Diamang. The National Directorate for the Mining Industry is at present negotiating a revised contract whereby the diamond fields will be divided into three concessions (Cuango, Andrada and Cafunfo) for which they are looking for foreign partners. MATS would then come in with an overall service contract, and Diamang would be liquidated to give way to the new joint companies with Endiama.

At present MATS is not totally in favour of the new proposals, because

they are concerned about the security situation. In 1984 there was a major attack on diamond mines in which several of their technicians were abducted. Since then there have been two more major attacks and numerous minor ones, culminating in an attack in March 1986 in which about 200 workers (mainly foreigners) were abducted to Zaire.

Related to the security situation, in 1985 MATS put forward a strategy plan for future production to the Angolan government which was rejected. This plan entailed the scaling down of operations to those most economic both in terms of grade and locality (in terms of security). Finally, MATS is also not in favour of being one of several operators, but with the overall technical services contract.

As MATS is controlled by a South African based TNC (De Beers) it cannot be ruled out that some of their attitudes could be influenced by the aggressive stance of the South African regime as the large majority of De Beers' investments are in that country.

In early 1985 MATS offered to collate all the existing information on the diamond bearing kimberlite pipes (they are not presently exploited) with a view to targetting those most viable for mining. The main advantage of in situ pipe mining is that it is concentrated in one locality and therefore easier to defend than the scattered alluvial workings. The main disadvantage is the large initial capital outlay (about 500 M USD).

Table 8

Angola: diamond production (Mcts) and percentage of exports

	1970	1971	1972	1973	1978	1979	1980	1981	1982	1983	1984	1985
Production	2.5e	2.41	2.16	2.13	0.70	0.84	1.50	1.40	1.22	1.01	0.92	0.72
% Exports	19.2	12.5	11.4	10.4	na	na	na	11.9	11.5	5.6	3.2	na

Notes:

e = estimate, na = not available.

Sources:

British Geological Survey, *World Mineral Statistics 1979—1983*, London, 1985. Dilolwa CR, *Contribuicao a Historia Economica de Angola*, Luanda, 1978; Ministerio de Plano de Angola, *Colecta . . .*, Luanda, 1986.

It would take approximately two years for the selection of a suitable pipe after the Angolan Government go-ahead which is still pending.

Until the end of 1985 all the official output was bought by the CSO but since then has most probably been stockpiled awaiting the new sales contract. Smuggling continues to be a major problem and for 1984/85 De Beers estimated it to be at the rate of 5 to 7 M USD/month (60 to 84 M USD/year), deduced from diamonds appearing on the European market.

Angola's diamond mining potential is considered to be several orders greater than present output, worth well over 0.5 G USD/year if developed. Reserves have been calculated at 90 Mcts but the potential is estimated at 350 Mcts²². The main limitation to the expansion of this sector is the security situation in the north-east of the country.

Iron and steel

Mining: iron ore

The iron ore mining firm, Companhia Mineira de Lobito, started up in 1929 with Portuguese capital (Sousa Machado family), but only obtained its first major mining concessions in 1949. A second mining company, Sociedade Mineira de Lombije, owned by the same family, acquired a mining concession for Kassinga iron ore deposits in 1953 and was later integrated into the Companhia Mineira de Lobito (1968).

The major capital injection of 1.3 G AOK came from Krupp (FRG), Højgaard & Schultz (Denmark) and a Portuguese company to the Lombije company for the opening up of the Kassinga mines, for putting in the railway to the port of Namibe and for the construction of the ore terminal. In 1965 Krupp loaned the Lobito company 1.5 G AOK for the purchase of locomotives and rolling stock to move the ore.²³

By 1969 the share capital of the Lobito Mining Company was 1.2 G AOK, 44.45 per cent held by the Portuguese State, 41.8 per cent by the

Angolan colonial state, 3.41 per cent by the Sousa Machado family and 10.54 per cent by the public. The decline of control by the Sousa Machado family came about due to gross financial mismanagement that provoked intervention by the state.²⁴

Production, exports and reserves

In 1958 exports of iron ore were 223 kt which had doubled to 545 kt by 1960. By 1964 they doubled yet again to 1 128 kt and from 1969 to 1973 exports oscillated between 5 and 6.4 Mt. In 1973 6 330 kt were exported and 6 052 kt were mined. In that year 94 per cent of production came from the opencast Kassinga mines of Jamba and Tchamutete with the rest coming from Mulanje district (Mounts Saia and Tumbi). The mines at Kwima (Huambo district) had been inactive for some time.

The known high grade secondary haematite ores at Kassinga were virtually exhausted by 1973 and exploitation of the huge primary itabirite reserves was planned. These were to be pelletized at the rate of 6 Mt/year of pellets²⁵.

The Kassinga reserves occur in pre-Cambrian banded ironstones as secondary (high grade) haematite ores, residual and elluvial "pebble ores" and primary (low grade) itabiritic ores²⁶.

With the South African invasion from the south in 1975 and their subsequent regular incursions into southern Angola, mining at Kassinga came to a standstill. In 1981 the state iron and manganese mining company, *Empresa Nacional de Ferro* (Ferrangol) was formed. Since its creation it has mainly been involved in the rehabilitation of the Kassinga operations, aided by Austromineral (Voest-Alpine, Austria) who have had a technical consultancy contract with Ferrangol for the last six years.

The first phase (1980/81) of the consultancy was a mining viability study for the Jamba mines, the second phase (1982 to 1985) entailed the rehabilitation of the mining equipment and the most

recent phase (finishing in July 1986) was for test mining operation runs. A new contract for the actual mining is likely to be signed shortly. The Austromineral consultancy was financed by Austrian government credits.

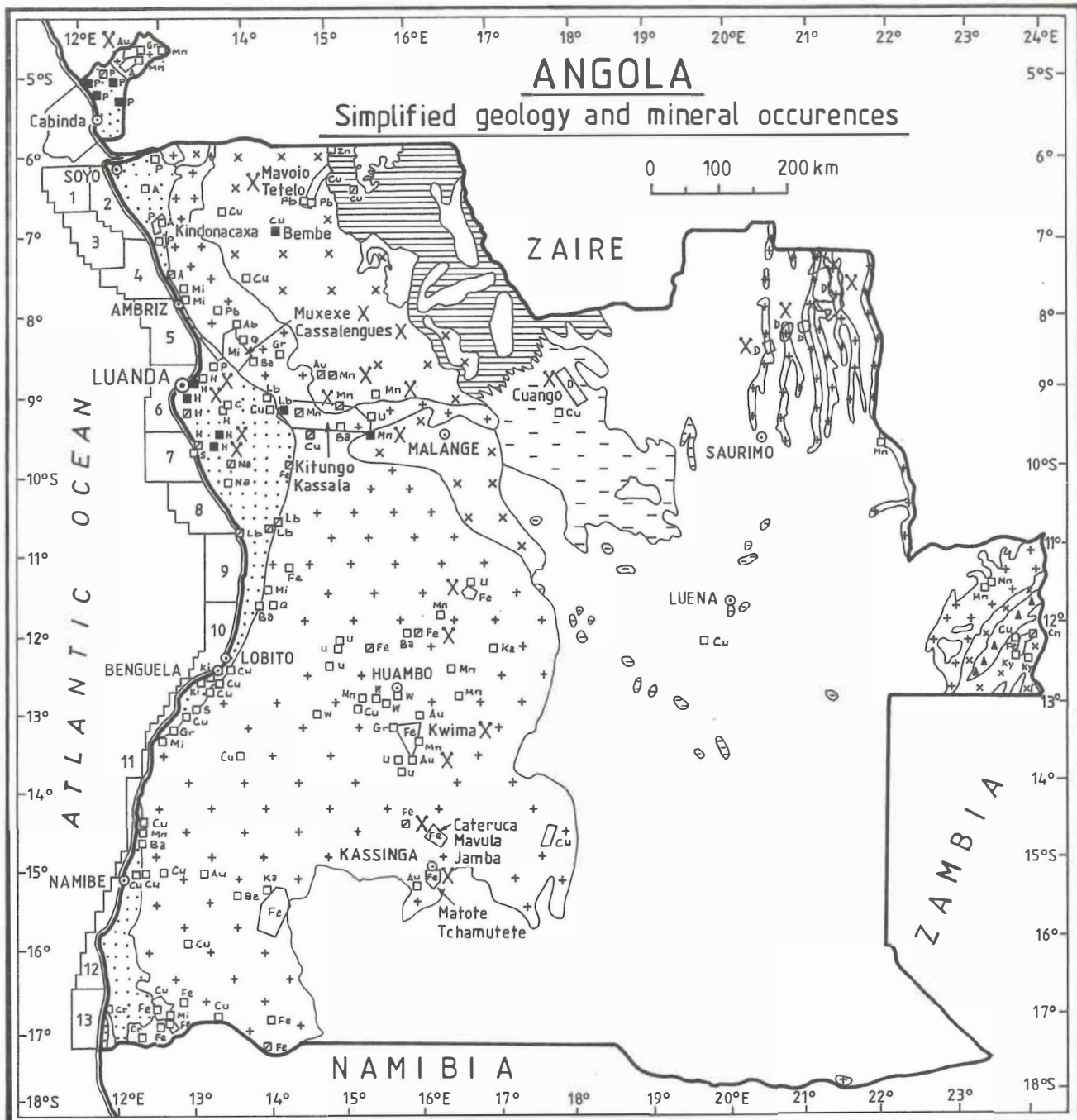
The reserves at Kassinga of detrital ore (40—45 per cent Fe) have been reassessed at 100 Mt (cut off grade of 40 per cent), while the reserves of lower grade (30—35 per cent Fe) primary ores stand at greater than 1 Gt²⁷.

Mining of the detrital limonite-haematite-martite ore is planned to start at the end of 1986 at the initial rate of 1.1 Mt/year of concentrate (72—74 per cent Fe). Although the railway from Kassinga to Namibe has been sabotaged in the past by South Africans and/or UNITA, the Angolan military think that its security can, in principle, be guaranteed.

Angola has numerous other iron ore deposits (see map) the most important of which is the huge Kassala-Kitungo resource, in the Kwanza-Norte Province 150 km ESE of Luanda. Pre-independence this deposit was evaluated by the Companhia de Manganes de Angola, but was never exploited. The Kassala and Kitungo deposits are situated 7 km apart and contain an estimated 300 Mt of primary ore grading 30 to 35 per cent Fe, mainly in the form of titanomagnetite in a country rock of norite. A project for the production of 2.5 Mt/year of pellets using a slurry pipeline to Luanda has been put on ice by Ferrangol, due to the high initial investment cost of roughly 500 M USD.

Smelting steel

The state enterprise Siderurgia Nacional in Luanda is the only producer of steel in the country. It used to belong to the Champalimand (Portugal) group of companies and initially rolled rails from imported ingots. In 1972 a small 18 ton arc furnace was installed for the production of ingots. At present it is smelting local scrap only, as pellets are still not locally available. The scrap is acquired



Geology		Minerals					
	Cretaceous - Quaternary	A	Asphalt	Gr	Graphite	Pb	Lead
	Tertiary (Kalahari)	Ag	Silver	H	Oil	Pt	Platinum
	Cretaceous (Kwango)	Au	Gold	Ka	Kaolin	Q	Quartz
	Pre Permian (?)	Ba	Barite	Ki	Diatomite	S	Sulphur
	Carbonaceous - Jurassic (Karoo)	Be	Beryl	Ky	Kyanite	Sn	Tin
	Pre Cambrian (West Congo)	C	Coal	Lb	"Libolite"	T	Talc
	Undifferentiated Pre Cambrian	Cn	Corundum	Mi	Mica	Ti	Titanium
	Major towns	Cr	Chromite	Mn	Manganese	U	Uranium
	International boundary	Cu	Copper	Na	Rock salt	V	Vanadium
	Geological contact	D	Diamonds	Ni	Nickel	W	Tungsten
	Oil concession blocks (see table 7 of text)	Fe	Iron ore	P	Phosphates	Zn	Zinc
		X	Exploited deposit				Deposit of unknown importance
		■	Deposit of importance				Area with dispersed deposits
		⊞	Deposit of secondary importance				

Source : Ocorrencias Minerais, DPSGM, 1965.

by their subsidiary, Sucasor and its availability is the major limitation on increasing production. To overcome this, it is planned to create two scrap purchasing companies, one working on the Luanda-Malanje line of rail and the other on the Lobito-Huambo line.

Production

Production of ingots in 1974 was 28.8 kt of ingots from which 26.6 kt of rod (6—30 mm) were rolled. By 1976 production had fallen to 2.6 kt of ingots and 2.8 kt of rod. Between 1979 and 1981 there was an attempt to rehabilitate the works with Italian technical assistance and in 1979 production peaked at 7.6 kt of ingots and 4.7 kt of rod before falling to 5.2 kt and 2.2 kt respectively in 1984²⁸. Planned production for 1986 is 6 kt of rod, depending on the availability of scrap. Most of their production is for the construction industry.

A technical assistance program with *Voest-Alpine Industrial Services* (VAIS) for the rehabilitation of Siderurgia Nacional expires in October 1986, but will most probably go into a second phase for the training of personnel.

A separate state company, FATA, imports steel sheet for the production of tube and angles. In 1973 14.3 kt of steel tube were produced which had dropped to 3 kt by 1985. In addition there are several small ferrous and "non-ferrous" foundries in Luanda.

Manganese

Manganese ore was produced at the Kiaponte and Kitota mines in Malanje Province until 1973 by the *Companhia do Manganese de Angola*. Over thirty years from 1943 to 1973 604 kt of ore were extracted²⁹. Production in 1972 was 37.7 kt and fell to 4.7 kt in 1973, while exports for the same years were 51.0 kt and 8.0 kt respectively.

The main occurrences are the Maiombe region (Cabinda), the Lucala region (Kiaponte and Kotota mines, Cuanza Norte and Malanje), Quicama (Bengo) and Capuia (Huambo). There are also

many other occurrences³⁰. Reserves in the most important region (Lucala) are estimated at 5 Mt of high grade ore (55—56 per cent Mn), but large areas have not been assessed³¹. Ferrangol is also responsible for manganese exploitation, but has no plans for the reactivation of the mines.

Phosphates

Angola has significant reserves of phosphates in the Cretaceous-Quaternary sediments north of Luanda and in Cabinda. A state company, *Empresa Mineira de Fosfatos do Zaire* (Fosfang), has been created to handle the exploitation of phosphates. The main resource is near the coast at Kindonacaxa, about 40 km north of the small port of N'zeto (see map). The phosphates in this zone are of marine origin in the form of cropolites and reserves have only been determined for a small area of 18 km² where there are 7 Mt of phosphate rock grading 29.4 per cent. Reserves for the whole zone are estimated to be greater than 200 Mt.

In 1982 an experimental pilot processing plant was set up at Kindonacaxa to concentrate the phosphate rock by Fosfang in collaboration with Bulgargeomin (Bulgaria). The plant operated at a rate of 15 kt/annum for 1983 and 1984, then shut down due to problems in the distribution of the product to the agricultural users in the centre and south of the country. The project will recommence as soon as conditions allow³².

The other major reserves are located in the Cabinda enclave and are similar to those of Kindonacaxa. Energoprojekt of Yugoslavia has been assessing these deposits and prognostic reserves are estimated at roughly 200 Mt. One of the deposits, at Mongo-tando, has 40 Mt of reserves grading 31.4 per cent P₂O₅. The Cabinda study is still in progress.

The polymetallic deposits of Tetelo-Bembe-Uige have been considered for the production of sulphuric acid as a by-

product from the processing of sulphide minerals for the manufacture of super-phosphates, as has the sulphur in natural gas³³.

Marble

Angola has several deposits of high quality marble, but only two quarries are in operation, due both to the shortage of skilled personnel and to the security situation. In 1973 1 457 m³ were quarried but the present output is only 8 per cent of this at roughly 120 m³ per year for the domestic market.

The quarries are run by the state company, *Empresa Nacional de Rochas Ornamentais* (Roremina), which has its head office in the south of the country at Lubango, in the region of the deposits. The quarrying of marble will be expanded as soon as conditions permit.

Granite

Roremina is also responsible for the exploitation of ornamental granite and it operates several quarries in the south of the country in the region of Chicuatite near Lubango. The black granite occurs in anorthosites and the Angolan product is internationally recognized. In 1973 output was just under 8 000 m³ but had fallen 80 per cent to 1 603 m³ in 1982. By 1985 output had fallen a further 70 per cent to 506 m³ (Table 5). All production is exported to Europe via the port of Namibe.

In 1980 it was estimated that with improvements in stone cutting techniques and marketing, production could be increased to up to 20 000 m³/year worth roughly 12 M USD, as the Angolan product has a ready market³⁴.

Quartz

The state crystalline quartz quarrying company, *Empresa Mineira de Quartzo* (Minaquartzo), is located in the south of the country in Kwanza Sul Province. The high purity fusing quartz occurs in the Condo region where the Pocaria I orebody is mined and has reserves estimated at 0.9 Mt in three veinlike orebod-

Advertisement for Cimangola.

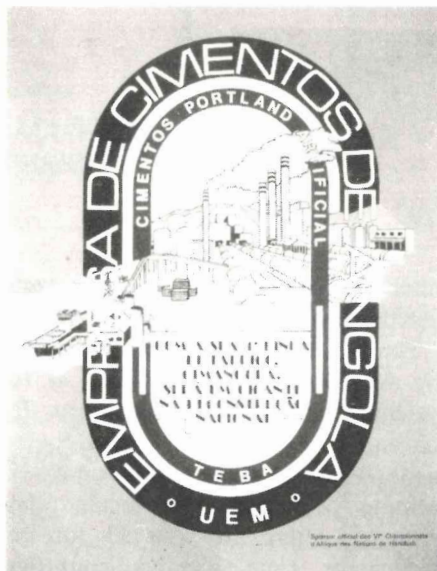
ies, but there are also several other unassessed veins³⁵.

Due to its high quality the quartz competes favourably on the world market. The operations are small-scale producing about 5 kt/year, but the company feels that with a small amount of investment, production could be expanded considerably to about 3 kt/year worth roughly 4 M USD, as the product has a ready export market³⁶. A technical assistance contract with Technoexport of the USSR for the development of quartz mining has been negotiated³⁷.

Cement

There are two cement plants in the country, in Luanda and Lobito. Cement production was 311.7 kt in 1968 and peaked at 767.6 kt in 1973³⁸. By 1980 production had decreased by two thirds to 253.0 kt and fell to 205.0 kt in 1985 (Table 5). The producing companies used to be Secil (Luanda) and Companhia de Cimentos de Angola (Lobito), but the latter company is not producing at the moment, while the former is now a mixed state enterprise called *Cimangola* (Empresa de Cimentos de Angola). The state has a majority shareholding in Cimangola and 31 per cent is held by a group made up of F L Smidth & Co and Højgaard & Schultz of Denmark who have a management and service contract running from 1985 to 1990. The Lobito company is now completely state owned and is called *Encime* (Empresa Nacional de Cimento).

Cimangola: The plant was built by Højgaard & Schultz in 1956 and in 1958 it produced 108.1 kt of cement. Production peaked in 1973 at 582.3 kt before falling to an all-time low of 66.7 kt in 1976. By 1980 production had recovered to 232.0 kt. The plant has three (wet) kilns producing clinker (max of 80 kt in 1973) which is milled in four crushers. In 1984 a rehabilitation plan was formulated to bring production up to 550 kt of clinker, 75 per cent of installed capacity (730 kt/year). The installation



of a forth (dry) kiln is also planned, to increase capacity to 1.5 Mt/year of clinker. Forecast production for 1986 is 350 kt. The limestone, clay and sand are quarried locally, 1 km from the plant, while the gypsum comes from Libongo, 80 km away³⁹.

Encime: the plant is not producing at the moment due to a shortage of HFO. It has a maximum capacity of 120 kt/year and a rehabilitation project with an East German company is in the pipeline.

Copper

The copper deposits in Uige Province in the north used to be mined by Empresa do Cobre de Angola which was linked to a Portuguese monopoly (CUF, later became Simeira). The three main deposits are at Mavoio, Tetelo (1 km apart and about 120 km north of Uige) and Bembe. These are metasomatic type deposits occurring in the West Congo formation and the copper is found in limestones and calcareous shales or sandstones of the "Schisto-Calcaire" Series, generally associated to the Luango Fault Zone. It is estimated that the Mavoio and Bembe mines produced some 170 kt of copper between 1939 and 1963 when mining ceased⁴⁰.

Mavoio: This deposit has two types of ores, primary sulphide ore in dolomites and secondary oxide ore in ferruginous "black earths". The mines are situated on a major fracture called "The Haematite Fault" and were closed in the early sixties when the high grade ores (10 per cent Cu) were exhausted, but there remain large sulphide ore reserves grading 2 to 3 per cent Cu with an unknown Co

content⁴¹. There are also local pockets of galena (Pb) and pyrite (S) which were not exploited.

Tetelo: The sulphide ores of this deposit occur in faulted and brecciated zones immediately adjacent to and to the north-east of the Mavoio deposit. In the early seventies the Simeira consortium assessed this deposit and estimated reserves to be 8.2 Mt at 2.6 per cent Cu (cut-off 0.5 per cent Cu) and 1.2 Mt at 7.99 per cent Cu (cut-off 3 per cent Cu) with associated cobalt (0.04–0.10 per cent) and silver (15 g/t). The stratiform ore body is between 150 and 300 m below the surface adjacent to the "Haematite Fault"⁴².

Bembe: This deposit is about 100 km north-west of Uige and was exploited in pre-colonial times. The Empresa de Cobre de Angola only mined the high grade oxide (malachite) pockets without much success, but there are also an unknown quantity of disseminated sulphide ore reserves in argillaceous sandstone.

Geological (inferred) ore reserves of the Tetelo-Bembe "zone" are estimated at 10 Mt at 2 per cent Cu. Although copper is the main metal there are also associated elements such as vanadium, cobalt, barium, lead, zinc, gold and silver⁴³. The National Directorate for the Mining Industry is at present interested in setting up a joint venture for the exploitation of the polymetallic sulphide deposits of Uige Province, dependent on an improvement of the security situation.

The major other copper "zone" is the extension of the Zambian Copper Belt metallogenic province in Alto Zambeze in the extreme east of the country (see map). Here inferred reserves are put at 10 Mt grading 1 per cent Cu⁴⁴. Due to the extremely isolated location of these deposits, there are no plans for their development at present.

There are also numerous other superficially known copper deposits in Angola, especially on the contact between the Cretaceous coastal sediments and the

pre-Cambrian basement south of Lobito (see map).

Gold

Gold occurs in numerous locations across the country generally in alluvial deposits. Up to 1965 about 560 kg of gold was produced in Angola from rudimentary small-scale mines and in 1973 0.5 kg was mined (Table 5), but all mining has ceased since then.⁴⁵ The main deposits are at Maiombe (Luili River, Cabinda), Lombige (Lombige River, Cuanza Norte), Gaudovira Cunene River, Huila and Huambo), Chipindo (Cuengue River, Huila) and Cassinga (Colui River, Cunene). There are also several other smaller occurrences⁴⁶.

The most favourable prospects are Chipindo (M'popo mine) and Lombige, both of which were exploited in the past. In addition to the alluvial recent and fossil placers, the gold also occurs in small but numerous quartz veins associated to "greenstones". Reserves at M'popo are estimated at 5 t of gold grading 6–10 g/t⁴⁷.

Carbonatite minerals

Angola has at least 14 carbonatite complexes. The two most important are Coola and Serra da Neve-Tchivira. These offer prospects for the future mining of nepheline, fluorite, niobium-tantalum, apatite and rare earths, but no work is being done on them at present. Fluorite reserves at Coola are estimated at 5 Mt grading 71 per cent and at Tchivira 6 Mt at 27–61 per cent F_2Ca ⁴⁸.

Exploration

Angola has a presently unknown mineral potential as only 20 per cent of the country has been geologically mapped at even 1:250 000 scale, let alone detailed surveys. There are undetermined reserves of chromite, platinum and nickel in the extreme south-west of the country, various alluvial gold deposits, several tungsten deposits in the centre of the country and numerous

other mineral occurrences that lack systematic appraisal (see map).

The first step in the development of the Angolan mineral potential is to systematically survey the country. To this end the Geological Survey Department (ING) has made some progress in training personnel both locally and overseas. There are also 13 foreign technicians from socialist countries aiding the ING.

The major obstacle to the expansion of exploration activity is still the low capacity of the ING and the security situation. It is hoped that the former will be overcome by the envisaged change of the Mining Law which will allow for joint mineral exploration ventures with private capital. As to the security situation, it is unlikely to improve much in the short term, but in the medium to long term the South Africans are likely to be forced to end their illegal occupation of Namibia and thereby their support to the bandits.

INFRASTRUCTURE

Ports, railways and roads

There are three main railways in Angola, all running from the coast to the interior on 1.067 m gauge (southern African standard). As in Mozambique, railways built by the colonizers ran from the mineral or agricultural resources in the interior to the coast to take the products to Europe. Hence there is no railway connecting the north and south of the country.

The principal line runs in the centre of the country from the port of Lobito and was built from 1906 to 1928 by Tanganyika Concessions (UK) to serve the Zairean and Zambian Copperbelt. In 1973 Lobito handled 2.56 Mt of cargo, mainly copper from the Copperbelt, but also some Angolan goods such as iron ore from Kwima and maize from the Huambo plateau⁴⁹. By 1985 Lobito handled a mere 17 per cent of the 1973 figure, due to South African direct and sponsored sabotage⁵⁰. The Benguela

line is to benefit from a major (210 M USD) SADCC rehabilitation project, once funds have been secured.

The port of Luanda handled 1.4 Mt of cargo in 1973 and is served by the northern Luanda-Malanje line (600 km) which mainly carried iron ore from Malanje and coffee from Uige. By 1984 the port handled 68 per cent of the 1973 volume (0.97 Mt), due to the drop in economic activity and the poor security situation⁵¹.

The southern line (713 km) running from the port of Namibe (ex Mocamedes) to the Kassinga mines and on the Menogue (Cuando Cubango), was built in the sixties specifically to carry the iron ore. In 1973 the port of Namibe handled 6.4 Mt, almost exclusively ore, and by 1984 this had fallen 96 per cent to 0.45 Mt due to the closure of the Kassinga mines and South African/UNITA sabotage. The port can handle ore carriers of about 160 000 dwt and can load ore at the rate of 5 kt/h.

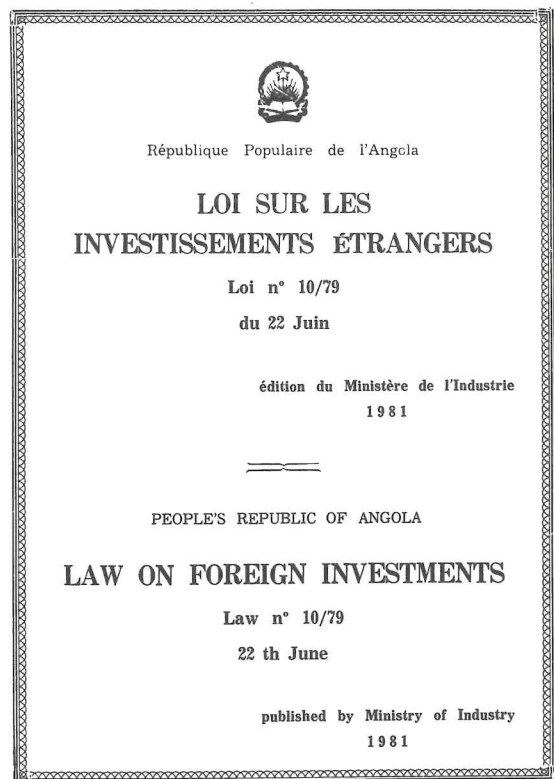
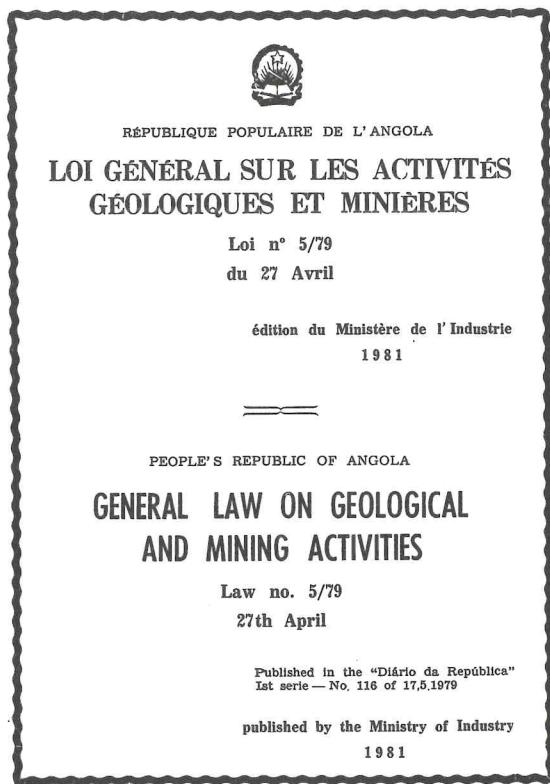
There is also a small narrow gauge line running 123 km from Porto Amboim to the Amboim highlands (coffee).

Roads: In 1973 Angola had over 72 000 km of roads, 7 777 km of which were asphalted, but there were still large areas of the country, especially in the east and south-east, with almost no road network. Since then, mainly as a result of the security situation, the condition of the road network has deteriorated drastically.

Energy

Angola has enormous hydroelectric potential estimated at over 86 000 GWh/year. Total HEP output in 1985 was 740 GWh, the same as 1973, and thermal output was 116 GWh. There is as yet no national grid linking the north, centre and south systems. There are also several new installations planned such as the Capanda HEP complex which will come on stream in 1990⁵².

The country also has significant oil reserves and a refinery in Luanda. The



product distribution system covers most of the main centres and an improvement project by the main distributor, Sonangol, is underway.

Angola is a vast country, almost the same size as South Africa, but has a fraction of its infrastructural system. Therefore, any major new mining project will have to face high infrastructure costs, unless it happens to be near one of the three main lines of rail.

LEGISLATION

Hydrocarbons

Under the Angolan Constitution (Fundamental Law) all mineral resources "... are the property of the State, which shall determine the conditions of their exploitation . . . " ⁵³. The Petroleum Law of 1978 governs all hydrocarbon exploration and production in Angola and under it Sonangol is the sole concessionaire with the right to explore for and produce petroleum, but can enter into association with foreign partners to achieve this. The association is for an agreed duration, divided into exploration, development and production periods. The law also has provisions for matters relating to conservation of resources and the environment, the utilization of natural gas, the training and utilization of Angolan personnel and

the participation in management of Sonangol in any association. Sonangol's share in any association operating in less than 150 m of water is set by the law at a minimum of 51 per cent ⁵⁴. There are two basic forms of association, namely, "production sharing agreements" and "joint ventures".

Joint Ventures: Under this form Sonangol is the part owner of the operation and its production share is proportional to its investment. This type of association was inherited from the colonial period and is the form for the Cabinda Cabgoc operation, in which Cabgoc is the technical operator for the venture. This is also the form for the onshore Congo and Kwanza operations (see Table 7).

Production Sharing Agreements: In this case the foreign operator acts as a contractor to Sonangol, is responsible for all of the investment and risk and receives a share of production in return. This form of association was initiated after the division of the continental shelf in 1978, for Blocks 1, 2, 3, 4, 6 and 9 (see Table 7). Under it there is also a "price cap" provision where there is a price cap for profit sharing, based on the UN cost inflation index. All profit in excess of this price cap goes to Sonangol ⁵⁵.

The contractor (partner) is exempt from all taxation except for the Income

Tax on Petroleum, the Statistical Levy of 1/1 000 "ad valorem" and stamp duties, up to a maximum tax of 50 per cent of profits under the price cap. All expatriate employees of the contractor are exempt from income tax ⁵⁶.

Sonangol has also entered into joint companies for servicing the oil industry, such as Petromar. These, non-oil production companies come under the Foreign Investments Law of 1979 which caters for joint ventures, mixed companies and private companies, but the last is only allowed for operations producing exclusively for export, or where the size of the investment and/or the technological level justify it ⁵⁷.

Mining

Under The General Law on Geological and Mining Activities of 1979, all mineral resources are the property of the State. Under Article 5 (1) of the law the State has exclusive right to mineral prospecting, exploration and research but can have service contracts with foreign companies ⁵⁸. Under Article 8 (1) the State also has the exclusive right to the exploitation of mineral resources which is conceded to the State owned mining companies (except for construction materials). Here again foreign capital may only participate in service contracts, ⁵⁹ but Articles 13 and 17 of the Mining

Law and Articles 7 to 10 of the Law on Foreign Investments,⁶⁰ appear to suggest that foreign capital may enter into association or partnership with State concerns for mineral exploration and exploitation, and the association may take the form of a joint venture or mixed company in which the State will hold a minimum of 51 per cent of the equity⁶¹.

The types and responsibilities of the associations are as defined by The Law on Foreign Investments in which the repatriation of after tax profits is allowed up to a limit of 25 per cent of invested capital⁶².

The Mining Law is at present undergoing revision to bring it in line with the Petroleum Law so that foreign risk or venture capital will be allowed in mineral exploration and mining in the form of joint ventures and/or production sharing agreements and it is hoped that this change will make investment in the minerals sector more attractive to foreign capital⁶³.

DISCUSSION

Until Salazar's "open-door" policy to Western investment in the sixties, the mineral sector of Angola consisted of a few, generally artisanal, mines except for diamond production in the north-east which had started on a large scale in the twenties. The huge mineral resources had hardly been touched by the Portuguese and the country was geologically unknown. This was principally due to Portugal being a neo-colony itself, particularly of Britain. It lacked the human resources and capital to develop its own resources, let alone the enormous resources of its "empire".

In a vain attempt to stem the rising tide of nationalism and the resulting guerilla wars in its colonies, Portugal opened up its "empire" to international capital. In the minerals sector this resulted in the rapid development in the

sixties of Angola's oil and iron ore resources. From 1960 to 1974 diamonds, oil and iron ore increased from 93.6 per cent of the total value of mineral production to 99.4 per cent. Over the same period mineral exports increased from 19.4 per cent to 60.8 per cent of the total value of exports and the total (current) value of minerals extracted increased from 0.65 M AOK to 18.5 M AOK⁶⁴.

The new investment policy also led to a flurry of prospecting activity, particularly from the South African-based mining colossus, Anglo American—De Beers through their subsidiaries such as Condiama and JCI (Johannesburg Consolidated Investment Company), but, unfortunately, this did not lead to a concomitant expansion in systematic geological survey on the part of the colonial state. By 1974 only 20 per cent of the country had been mapped at the large scale of 1:250 000. At the end of 1974 there were 20 companies with a total of 95 exclusive prospecting concessions including Diamang. Companhia Mineira do Lobito, Cabgoc, Petrangol, Empresa do cobre de Angola and Condiama. At the end of the same year there were 1 631 claims on 226 mineral deposits⁶⁵.

With the invasions of 1975/76 and South Africa's undeclared war of destabilization since then, almost all the small-scale artisanal workings stopped, resulting in a situation at present where there are only two major minerals produced, oil and diamonds. Iron ore could be back in production by the end of 1986 but the mine's location in the south of the country makes it extremely vulnerable to South African attacks. This, and the constantly falling real price of iron ore on the international market, down 70 per cent since 1960⁶⁶, means that the future of the project remains insecure.

Backward and forward linkages between the minerals sector and the rest of the economy have been, and continue to

be, almost non-existent. In terms of forward linkages, virtually all mineral production is exported, or vertically integrated into the developed market economies. About 10 per cent of oil production is refined locally before export and all diamond production is exported, legally or illicitly. The only sector with high linkages is the tiny mineral building materials sector comprising, sand, clay, limestone, gypsum, stone and marble.

In terms of backward linkages, there have never been industries, other than fuel, supplying mining inputs. All machinery, explosives, chemicals, plant, etc . . . have had to be imported. As with forward (downstream) linkages, the minerals sector is also linked backwards (upstream) to the developed countries. In 1983 78 per cent of imports and 87 per cent of exports went to or came from Western Europe and North America. The USA alone took 47 per cent of exports (oil) in that year⁶⁷.

Planned projects for further processing such as the urea and PVC plant based on natural gas (Soyo), the phosphate fertilizer plant (Kindonacaxa), the expansions of the refinery (Luanda) and the cement plant (Luanda), and the pelletizing of iron ore (Kassinga), will retain some value in the country as well as making available limited amounts as inputs to local industry and agriculture, but the large majority of production will still have to be exported due to the limited size of the domestic market.

Investment by Sonangol into enterprises constructing equipment for the oil industry (Petromar) has managed to keep some of the value inside the country though these companies are themselves highly dependent on imported inputs.

The essential prerequisite to the development of the economy and with it the country's mineral resources is the ending, or at least diminishing of the South African/UNITA war. This would not only open up for exploration and

exploitation minerals in presently dangerous zones, but would also release enormous financial and human resources from the war effort. Defence is the largest recipient of the national budget, of scarce foreign exchange and of human resources.

The key to the ending of the war is the decolonization of Namibia by South Africa, but this is unlikely to happen in the short term as their occupation of Namibia and destabilization of Angola now has the tacit support of the USA. Also, UNITA is now able to receive open assistance from the USA, since the repeal of the Clarke Amendment (which banned aid to UNITA in 1976) in July 1985. In 1986 the USA decided to give UNITA 77 M USD for military and "humanitarian" aid, and the UNITA leader, Jonas Savimbi, was received by Reagan and given "head of state" treatment in Washington.

It would therefore appear that the war will drag on until there is a change of policy in the White House, or a change of government in Pretoria.

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Appendix

Angola's trading partners (in USD)

	1982	1983
Imports		
Portugal	103.7	109.5
France	94.0	81.6
Brazil	40.9	54.6
Netherlands	41.3	54.4
US	122.0	48.7
FDR	45.2	34.1
Japan	43.8	32.0
UK	50.9	31.8
GDR	28.9	30.2
Italy	49.4	28.7
Sweden	39.3	23.0
Cuba	26.3	20.7
Exports	1982	1983
US	424.3	737.3
UK	298.6	189.1
Netherlands	105.9	188.2
Brazil	134.6	163.1
Spain	233.0	147.7
FDR	8.9	75.9
Curacao	—	58.2
Virgin Isl	81.9	39.0
Bahamas	45.3	35.2
GDR	31.0	36.0
Belgium	111.4	29.3
Portugal	19.4	8.5

Note:

Exchange rate: 1 USD = 30 AOK.

Source:

South, November 1986; Ministry of Planning, Angola (June 1986).

Angola: relative mineral production

Production	Diamonds Mcts	Iron ore Mt	Crude oil kt	Gas (LPG) Mbbbl
1975	1.0	5.6	8 750.0	—
1980	1.5	—	7 420.0	—
1983	1.0	—	8 400.0	2.1
<i>% SADCC:</i>				
1975	25.7	61.7	100.0	—
1980	21.5	—	100.0	—
1983	8.3	—	100.0	100.0
<i>% Southern Africa:</i>				
1975	3.9	26.2	99.9	—
1980	5.5	—	87.5	—
1983	2.9	—	86.7	100.0
<i>% West:</i>				
1975	13.6	1.6	1.6	—
1980	17.6	—	1.2	—
1983	6.1	—	1.2	na
<i>% World:</i>				
1975	2.4	0.6	0.3	—
1980	3.6	—	0.3	—
1983	1.8	—	0.3	na

Notes:

SADCC: Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe.

Southern Africa: SADCC plus Zaire, Namibia and RSA.

West: Europe (except CMEA), North America, Oceania, Japan, Israel and RSA.

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