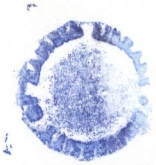
DEVELOPING SMALL-SCALE MINING IN MALAWI

BY

EVANCE E.M. CHIPILI

A dissertation submitted to the University of Zambia in partial fulfillment of the requirements for the degree of Master of Mineral Sciences



THE UNIVERSITY OF ZAMBIA

LUSAKA

DECEMBER, 2000

DECLARATION

I, EVANCE E.M. CHIPILI, hereby declare that this dissertation represents my own work, and that it has never been submitted in part or in full for a degree at this or any other University.

Signed: _____

Date: December, 2000

This dissertation by EVANCE E.M. CHIPILI is approved as fulfilling part of the requirements for the award of the degree of Master of Mineral Sciences by the University of Zambia.

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3. _____ (External Examiner)	_____

DEDICATION

This dissertation is dedicated to my dear wife Doria and my two daughters, Flora and Kate. It has also been compiled in loving memory of my father, the late E.D.M.Chipili (RIP).

ACKNOWLEDGEMENTS

I would like to express my profound gratitude and appreciation to Dr S.M. Kambani, my supervisor, for his constructive criticisms and guidance without which this dissertation would not have taken the form it has taken. I did not take such invaluable assistance for granted.

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Finally, I would like to thank my wife, Doria for her patience and moral support and encouragement.

ABSTRACT

Malawi is endowed with a variety of mineral resources. Predominant among these are gemstones, industrial minerals, construction mineral materials and fuel minerals such as coal. However, most of these are small deposits, amenable by small-scale mining (SSM). Therefore, the promotion and development of SSM can be considered an important option for exploiting these mineral resources of the country. Once developed, SSM has the potential to contribute significantly to the economy of the country. Efforts by government institutions to assist the mining and minerals sector have not brought the expected level of development in the sector. Consequently, most of the minerals remain unexploited.

The principal objective of this study is to identify sectoral constraints associated with technical, administrative, financial and legal factors, which directly and indirectly affect investment and development of SSM. A review is made of the status of the mining sector and mineral development potential. The study further suggests promotional strategies required for the successful development of the SSM sector in Malawi.

Recommendations are given which emphasise on a vigorous approach and commitment by Government and other key players in the sector in implementing the strategies for the development of SSM in Malawi.

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CHAPTER ONE

1.0 Introduction

Malawi is a long narrow country located in the southern part of the East African Rift Valley and lies between 9° and 17° south of the equator between longitudes 32°40' and 35°55'E. It has an area of 119, 140 km^2 of which one fifth is taken up by Lake Malawi. As illustrated in Figure 1, it is land-locked, cradled by Mozambique in the east, south and southwest, with Zambia to the west and Tanzania to north and northeast. The country has a population of about 10 million people (National Statistical Office, 1999).

The economy of Malawi depends on agriculture to feed its population and cash crops for generating the scarce foreign exchange. About 85% of the population work in the subsistence sector, engaged mainly in small holder farming, producing various cash crops. The main export crops are tobacco, tea, coffee, cotton and sugar with tobacco being the principal foreign exchange earner. Approximately 90% of Malawi export earnings are generated by the agro-industry. However, the anti-smoking campaign, which has gained momentum, has created uncertainties over the future of the tobacco market. Diversification of the nation's economy is, therefore, the goal of the Malawian Government's policy for sustainable economic growth. A broad-based economy can be created with the development of other sectors which can support

the agricultural sector which continues to play a vital role at the moment. In this regard mining has been identified as one of the sectors having potential to contribute to economic growth and development.

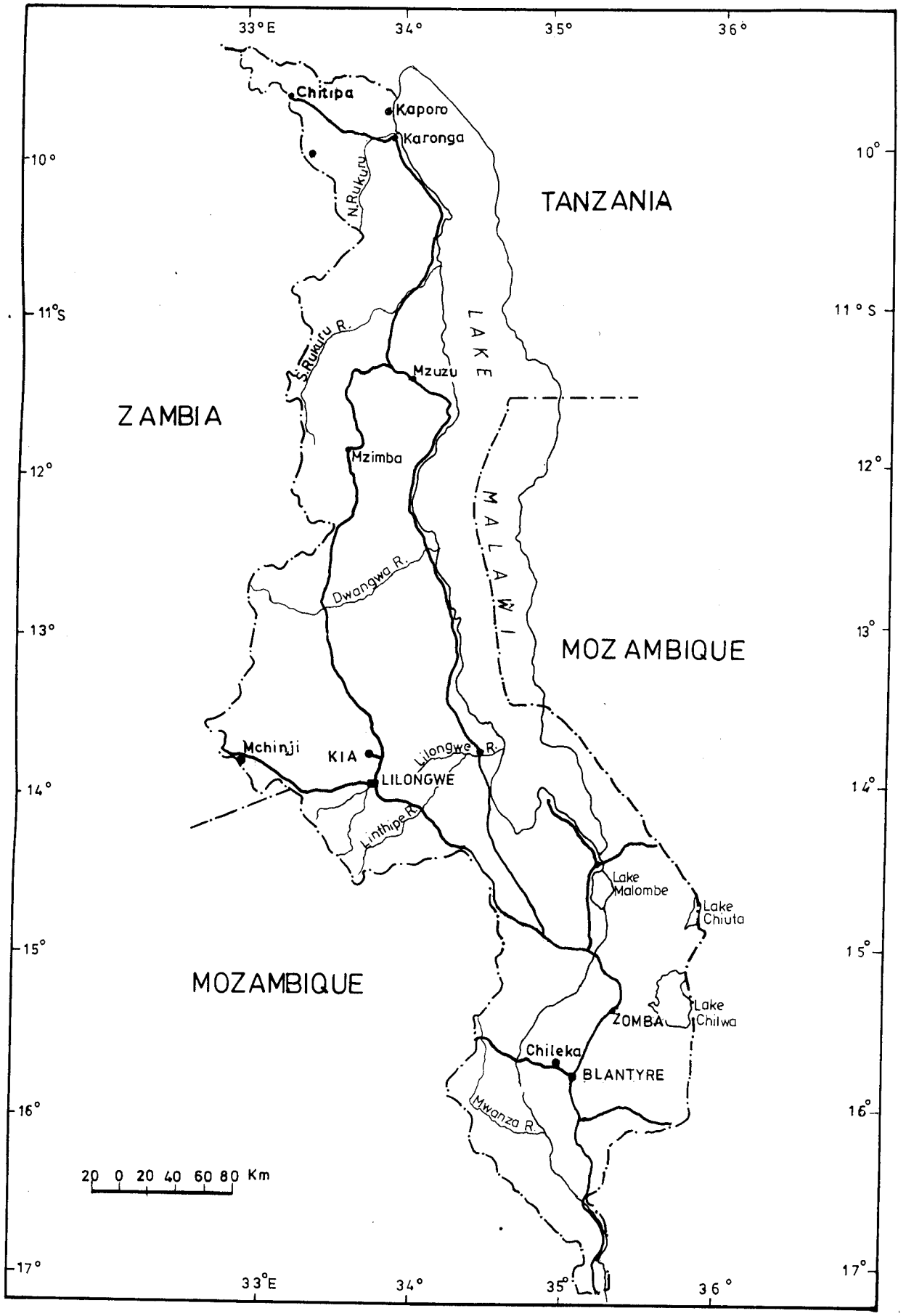


Fig 1: Map of Malawi
Source: GSD, 1997

1.1 Statement of the Problem

Malawi is endowed with a wide variety of mineral resources. However, most of these resources remain unexploited due to government policies which have placed emphasis on agriculture. As a result, the mining sector in Malawi has not developed to comparable levels with other countries in the region.

Known mineral resources in Malawi are mostly small deposits largely amenable by Small-Scale Mining (SSM). The promotion and development of SSM, therefore, appears a viable option for exploiting the country's mineral resources. To achieve this there is need to examine the elements critical to the development and strengthening of the SSM sector. The lack of development of the sector compounded by the fact that most of the mineral deposits remain unexploited, is a clear indication that the sector is confronted by constraints affecting its successful growth. The study will focus on analysing the constraints and suggest strategies and options for SSM sector development in Malawi.

1.2 Objectives of the study

The principal objectives of this study will be to examine the elements critical to the promotion of SSM development in Malawi. This will include identifying promotional strategies to improve the existing situation such as:

- Enabling legislation.
- Improved technology and its accessibility.
- Fiscal incentives.
- Improved accessibility to finances.
- Institutional framework support.
- Establishment of formal marketing systems.
- Provision of training and extension services.

CHAPTER TWO

2.0 Geology of the Country

The country lies mainly within the Mozambican Mobile Belt. Figure 2 illustrates the geology of Malawi. It is underlain by crystalline rocks of Precambrian to Lower Paleozoic age designated the "Malawi Basement complex" (Carter and Bennett, 1973). They are mainly metamorphosed gneisses and granulites of both sedimentary and igneous origin. The complex is thought to have evolved from the early Precambrian, and has been affected by orogenic episodes comprising the Ubendian, Irumide and the Mozambican cycles. The Basement Complex, which occupies 85% of the land area of the country constitutes the Malawi province of the Mozambican orogenic belt divided into northern and southern sub-provinces separated by the Chimaliro Dislocation Zone on the southern edge of Champhira Dome as indicated in Figure 3.

Overlying the complex is the Karoo supergroup, ranging in age form Permian to Upper Triassic or Lower Jurassic, best developed in the north of the country. The Karroo supergroup, which includes sandstone, mudstones and coal measures generally, lies unconformably on the basement rocks. The Karroo rocks are preserved in a number of north-south trending basins and down-faulted troughs, including the Malawi Rift Valley system. Specifically this sequence is preserved in Ngana, North Rukuru and Livingstonia Coalfields in the north; and Lengwe and Mabvi coalfields in the south.

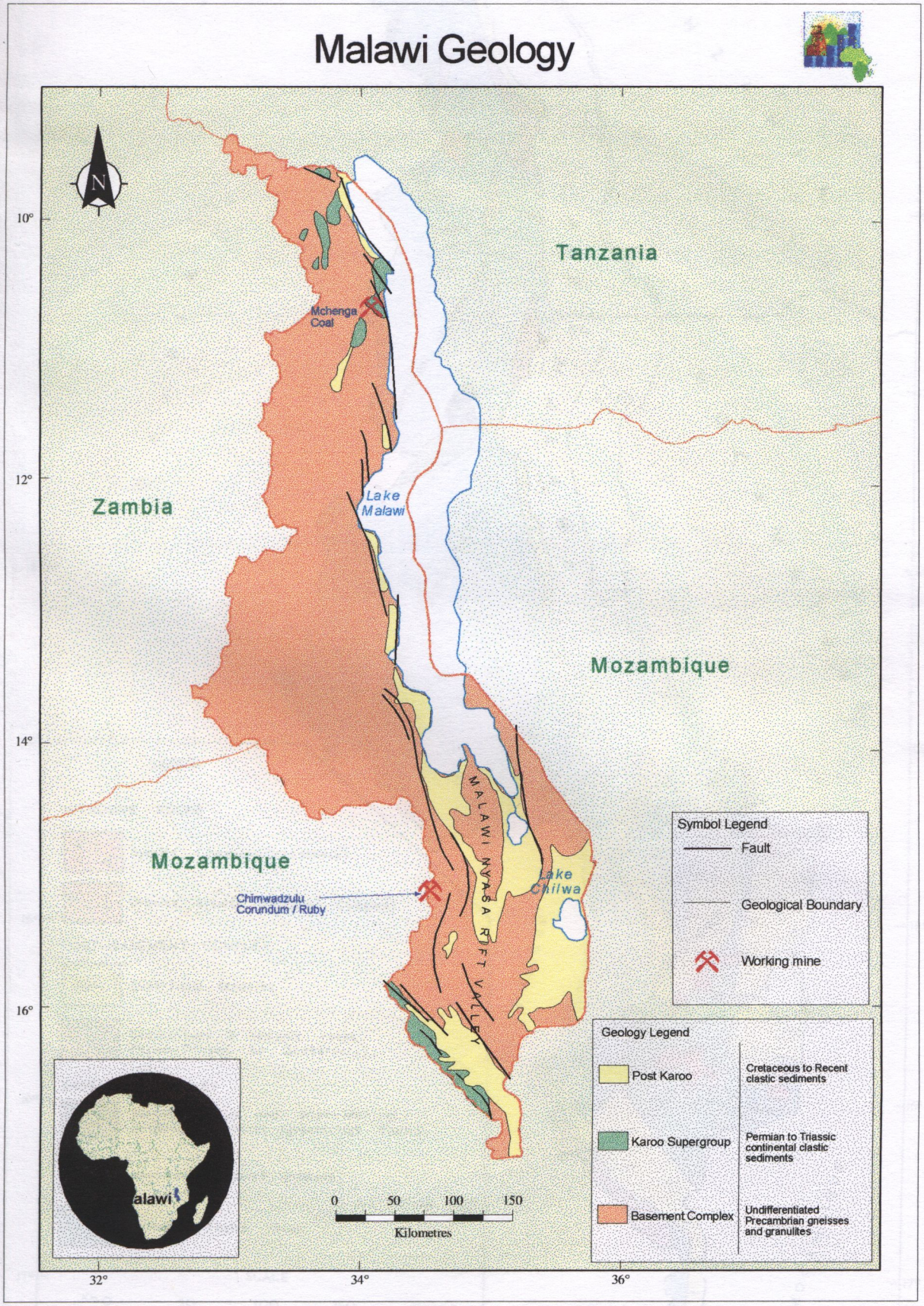


Fig 2: Geological Map of Malawi
Source : GSD, 1999

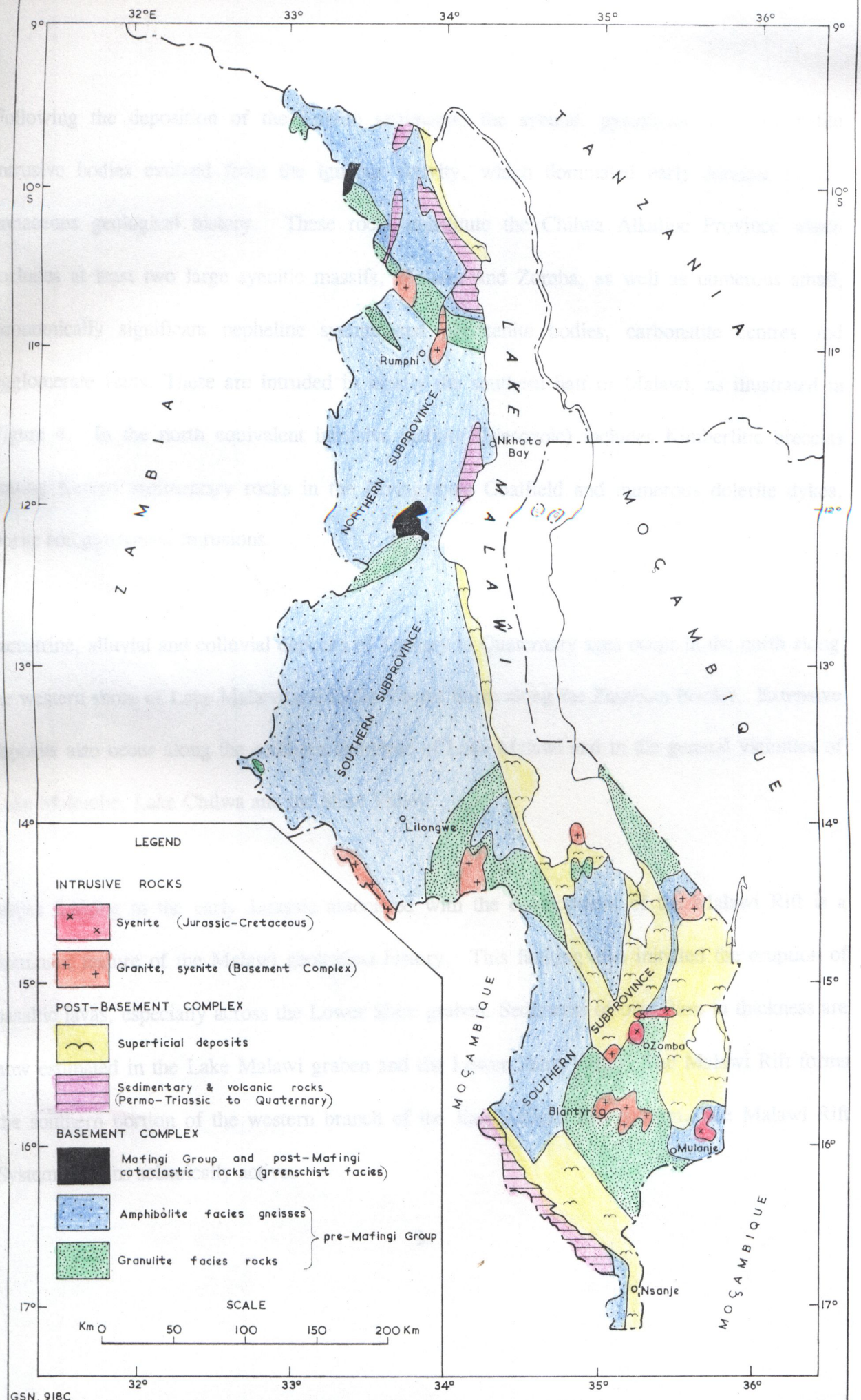


Fig 3 : Major Geological Units

Following the deposition of the Karroo sediments, the syenite, pyroxenite and carbonatite intrusive bodies evolved from the igneous activity, which dominated early Jurassic to late cretaceous geological history. These rocks constitute the Chilwa Alkaline Province which includes at least two large syenitic massifs, Mulanje and Zomba, as well as numerous small, economically significant nepheline syenite and pyroxenite bodies, carbonatite centres and agglomerate vents. These are intruded in mostly the southern half of Malawi, as illustrated in Figure 4. In the north equivalent intrusive activity (Mesozoic) includes Kimberlitic breccias cutting Karroo sedimentary rocks in the Livingstonia Coalfield and numerous dolerite dykes, diorite and pyroxenite intrusions.

Lacustrine, alluvial and colluvial deposits of Tertiary to Quaternary ages occur in the north along the western shore of Lake Malawi and in the Vwaza Basin along the Zambian Border. Extensive deposits also occur along the southern shoreline of Lake Malawi and in the general vicinities of Lake Malombe, Lake Chilwa and the Shire Valley.

Major faulting in the early Jurassic associated with the development of the Malawi Rift is a dominant feature of the Malawi geological history. This faulting also initiated the eruption of basaltic lavas, especially across the Lower Shire graben. Sediments of over 3km in thickness are now estimated in the Lake Malawi graben and the Lower Shire Valley. The Malawi Rift forms the southern portion of the western branch of the East African Rift System. The Malawi Rift System remains seismically active.

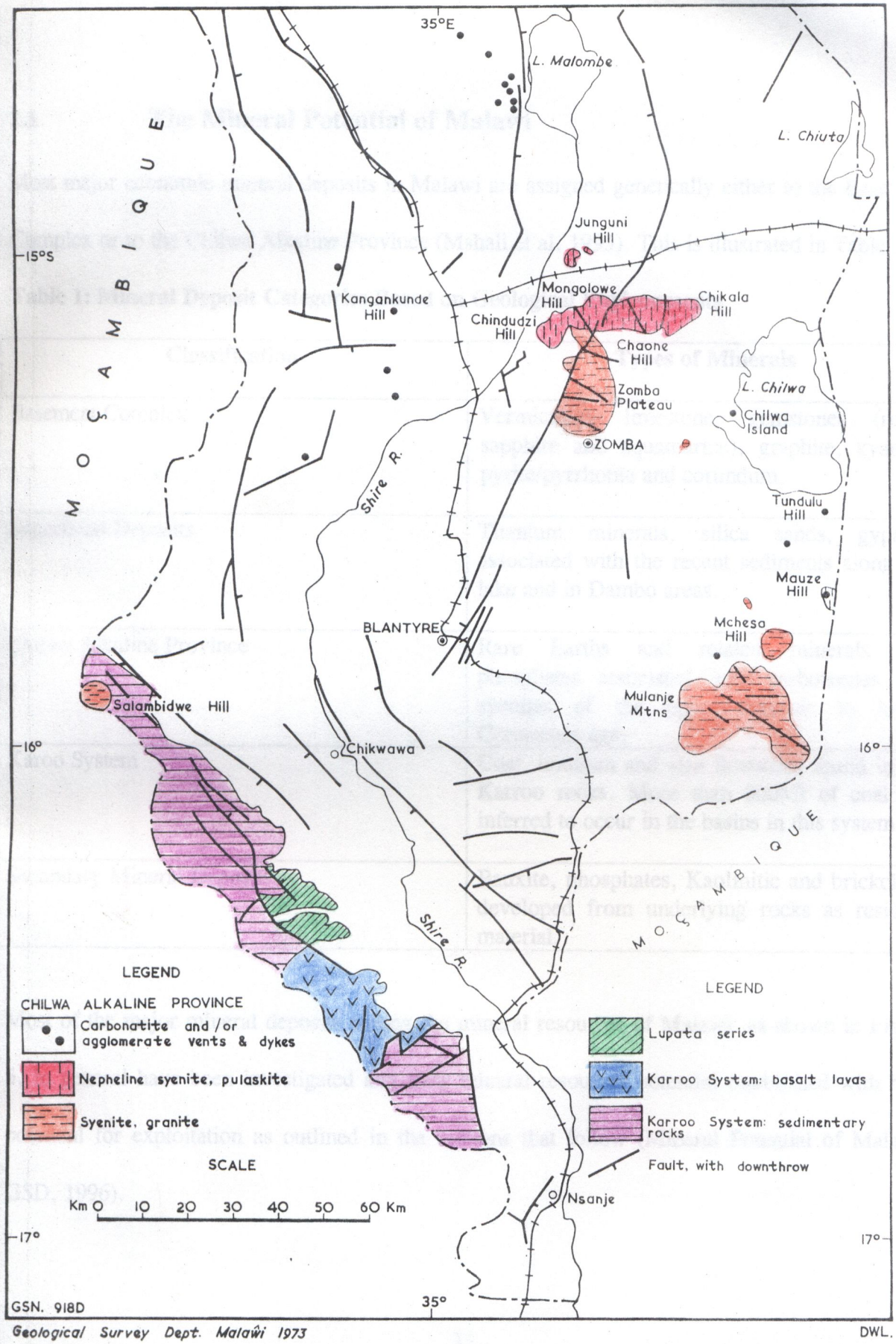


Fig 4 : Chilwa Alkaline Province

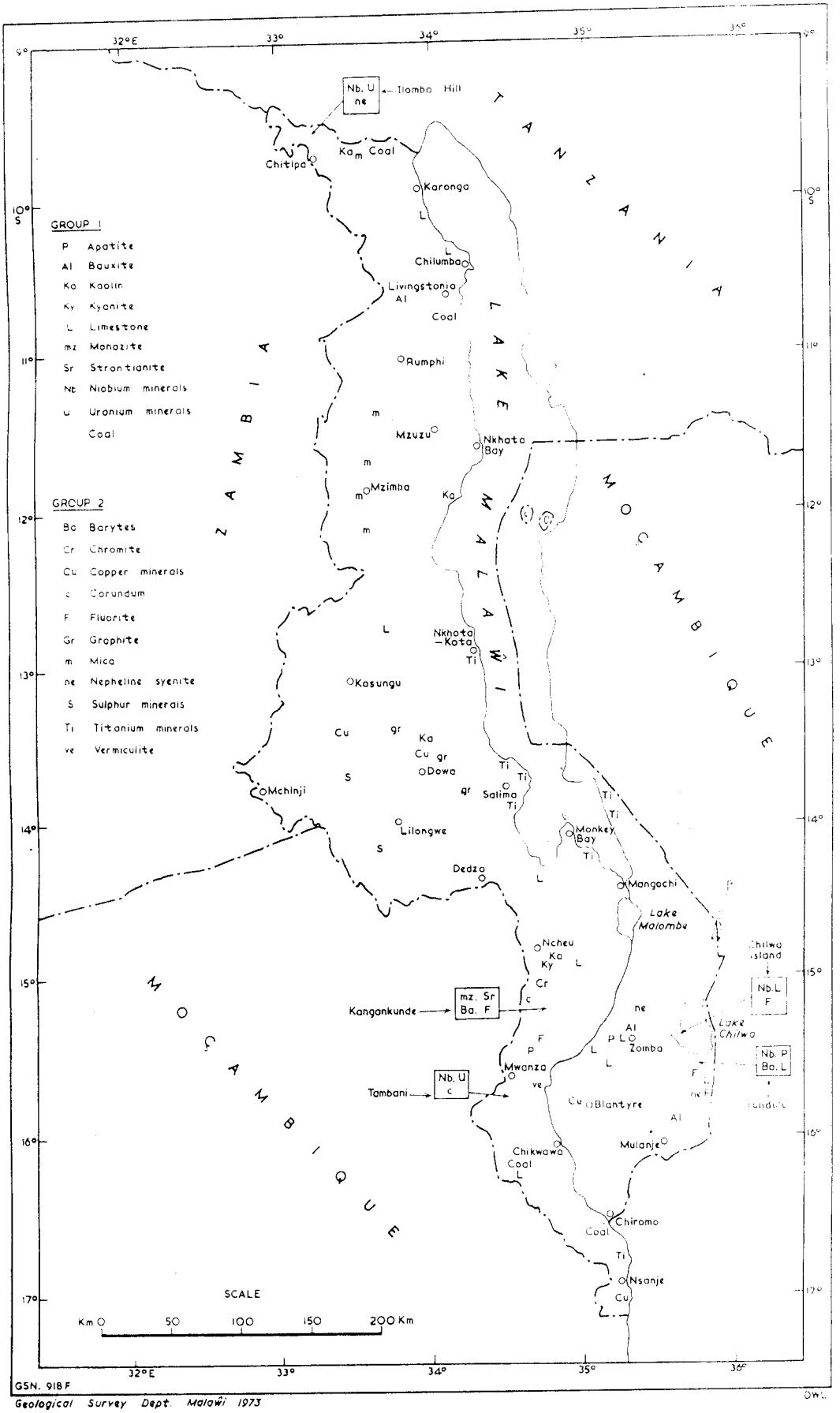
2.1 The Mineral Potential of Malawi

Most major economic mineral deposits in Malawi are assigned genetically either to the Basement Complex or to the Chilwa Alkaline Province (Mshali et al, 1993). This is illustrated in Table 1.

Table 1: Mineral Deposit Categories Based on Geological Environments

Classification	Types of Minerals
Basement Complex	Vermiculite, limestone, gemstones (ruby, sapphire and aquamarine), graphite, kyanite, pyrite/pyrrhotite and corundum.
Superficial Deposits	Titanium minerals, silica sands, gypsum associated with the recent sediments along the lake and in Dambo areas.
Chilwa Alkaline Province	Rare Earths and related minerals and phosphates associated with carbonatites and syenites of the upper Jurassic to lower Cretaceous age.
Karoo System	Coal, uranium and also limestone found in the Karroo rocks. More than 800Mt of coal are inferred to occur in the basins in this system
Secondary Mineral Deposits	Bauxite, phosphates, Kaolinitic and brickclays developed from underlying rocks as residual material.

Most of the major mineral deposits among the mineral resources of Malawi, as shown in Figure 5, in general have been investigated and their mineral resources potential established with high potential for exploitation as outlined in the sections that follow (Mineral Potential of Malawi, GSD, 1996).



GSN. 918 F

Geological Survey Dept. Malawi 1973

Fig 5 : Mineral Resources and Occurrences

2.1.1 Mulanje Bauxite

Deposits of commercial grade bauxite lie on Lichenya Plateau on top of Mulanje Mountain. Minable resources placed at 28 million tonnes with an average composition of 43.9% Al_2O_3 and 13.3 % free quartz have been delineated.

2.1.2 Kangankunde Monazite/Strontianite

A deposit of rare earth minerals and strontianite is found in a carbonatite complex at Kangankunde Hill in Machinga District. Drilling indicated reserves of 11.0 million tonnes of ore have been delineated at an average grade of 2.0% rare earth oxides (REO) and 8.0% strontium (sr).

2.1.3 Katangeza Graphite

Deposits of graphite occur at Katengeza village in Dowa District. A conservative 2.7 million tonnes of ore averaging 5.8% carbon (c) have been delineated.

2.1.4 Mwanza Vermiculite

Deposits of good quality vermiculite are found at four centres in Mwanza District. 2.2 million tonnes of vermiculite have been delineated. The quality of the vermiculite is comparable to that mined at Parabora in South Africa. It has an expansion ratio of 12:1 grading 10%.

2.1.5 Heavy Mineral Sands

Heavy minerals sands deposits for titanium minerals are found at Tengani in Nsanje District and the Lakeshore area in Salima District. The Tengani heavy mineral sands have a relatively high content of rutile averaging 0.34% while ilmenite ranges from 1-4%. A hundred million tonnes of ore are indicated from widely spaced pitting.

2.1.6 Dimension Stone

Deposits of beautiful sodalite occur at Ilomba Hill in the district of Chitipa. Large reserves have been outlined from a modest drilling programme. Large deposits of black granite are found at Mkanda area in Mchinji District.

2.1.7 Gemstones

Gemstones such as rubies and sapphires are found at Chimwadzulu Hill to the South of Ntcheu Boma. The commonest gemstone found is aquamarine followed by amethyst and rhodolite. These and others such as green beryl, heliodor, coloured tourmalines, smoky quartz, rose quartz, rhodolite, garnet, and agate are widely found in the districts of Mzimba, and Chitipa in the northern region, Ntcheu in the central and Mwanza, Zomba and Nsanje in the south.

2.1.8 Tundulu Phosphate

A deposit of phosphate suitable for the manufacture of fertilizers is found at Tundulu in Mulanje District. About 1.0 million tonnes grading 17% P_2O_5 have been delineated. Met-Chem Canada Inc. completed a preliminary review in 1998 of the Tundulu rock phosphate deposit. The results of the study showed that besides phosphate, the carbonatite has other minerals of economic importance. These include niobium (1.7kg/t) and medium-weight Rare Earths (1.9kg/t). The recovery of these minerals could contribute to the lowering of the P_2O_5 cut-off grade, thereby increasing the phosphate ore reserve.

2.1.9 Limestone/Marble

Large limestone deposits are located at Chikoa/Livwezi in Kasungu District and Golomoti (Bwanje) in Dedza District.

The deposits in Kasungu are being utilised for the manufacture of Portland cement. The estimated reserves were placed at 17 million tonnes of cement grade limestone.

Malawi is also endowed in several localities with calcitic and dolomitic limestones of high purity carbonate content.

2.1.9.1 High Calcium Marble

There exists a high calcium marble deposit on Malowa Hill east of Golomoti in the Bwanje valley. A total of 4.08 million tonnes has been proven and are slated for the manufacture of chemical-grade lime. The reserve contains an average grade of 52% CaO, 0.99% MgO and 5.22% SiO_2.

A probable reserve of 14.85 million tonnes containing 46.83% CaO and 1.36% MgO has been delineated for the calcitic marble unit.

A dolomitic marble proven reserve of 3.7 million tonnes also exists within the same area. This unit contains an average of 36.21% CaO, 12.99% MgO and 8.6 % SiO_2. A probable reserve of 17.53 million tonnes has been estimated to contain 36.61% CaO and 7.14% MgO.

The overall resource estimate for Malowa marble is therefore 22.38 million tonnes with a combined proven reserve of 7.78 million tonnes. The project started at Bwanje valley limestone was aimed at establishing lime works at Malowa.

A feasibility study was conducted by MET-CHEM of Canada through Mining Investment Development Corporation. Through this study a plant has been designed to produce 50 tonnes per day of quick lime (equivalent to 60 tonnes per day of hydrated lime). This capacity has been based on the current demand of lime.

gneisses and perthosites. From this resource it is estimated that 26.50 million bricks can be made by mechanised brick making plants.

2.1.12 Glass Sands

Substantial deposits of glass sands occur in dambos around Mchinji. Recoverable reserves in six dambos amount to 1.6 million tonnes. Silica percentage for the sand varies from 96% to 99% while the iron percentage varies from 0.12 to 0.2%. The deposits are suitable for the manufacture of good quality glass.

Another glass sand reserve, the Lake Chiuta sand bar is estimated to have 25 million tonnes and contains 92.7% silica and 0.62% iron. Further beneficiation will improve the quality of the sand to make it suitable for manufacture of plate and window glass and reasonably clear glass containers.

2.1.13 Coal

Substantial resources of semi-bituminous coal have been delineated in several of the Karroo basins of Malawi. Presently, about 50 thousand tonnes of coal per annum are being produced at Mchenga coalmine in the northern region of Malawi. For details of the coal reserves in Malawi see Table 1.

2.1.4 Iron Sulphides

Substantial resources of pyrite/pyrrhotite have been outlined at two localities in the central part of Malawi. Reserves of 34 million tonnes grading 8% sulphur have been delineated at Nkhanyu Hill in Dowa District. Another 10 million tonnes of reserves with a sulphur content of 10% are located at Malingunde Hill in Lilongwe District.

Table 2 gives a comprehensive summary of the mineral deposits of Malawi and reserves.

Table 2: Industrial Mineral Deposits and Reserves

MINERAL	LOCATION*	RESERVES (Tonnes)	GRADE %
Bauxite	Mulanje Mt	28,000,000	43.3 Al_2O_3
Rare Earths	Kangankunde	11,000,000	2.0 Reo
		11,000,000	8.0 Sr
Vermiculite	Feremu	2,500,000	10
Phosphates	Tundulu	1,000,000	17 P_2O_5
	Chingale	8,800,000	3.7 P_2O_5
Graphite	Katengeza	2,700,000	3
Limestone	Bwanje	7,780,000	52 CaO
	Chenkumbi	10,000,000	-
	Chamama/	17,000,000	-
Kaolinitic Clays	Linthipe	15,000,000	33.8 Al_2O_3
	Senzani	500,000	-
Glass Sand	Mchinji	1,600,000	97.0 SiO_2
	Lake Chilwa/Chiuta	25,000,000	92.7 SiO_2
Titanium minerals	Tengani	100,000,000	0.34 rutile 1-4 ilmenite
	Salima	70,000,000	-
Coal	Ngana	15,000,000	21 Ash
	Mwabvi	4,700,000	40 Ash
	Lengwe	10,000,000	50 Ash
	North Rukuru	5,000,000	28 Ash
	Lufira	600,000	-
	Livingstonia	1,400,000	14 Ash
	Nthalire	15,000,000	-
Iron Sulphides	Chisepo	34,000,000	8 s
	Malingunde	10,000,000	10 s
Uranium	Kayelekera	63,000	0.17 u

Reo – Rare Earth Oxides. Sr - Strontium. Source: GSD Malawi, 1997

Several local and international companies hold mining concessions for various mineral deposits as indicated in Figure 6. In some cases, however, the licenses are dormant and

with others progress has been disappointingly very slow and this is one area of major concern for the development of the mining sector in Malawi.

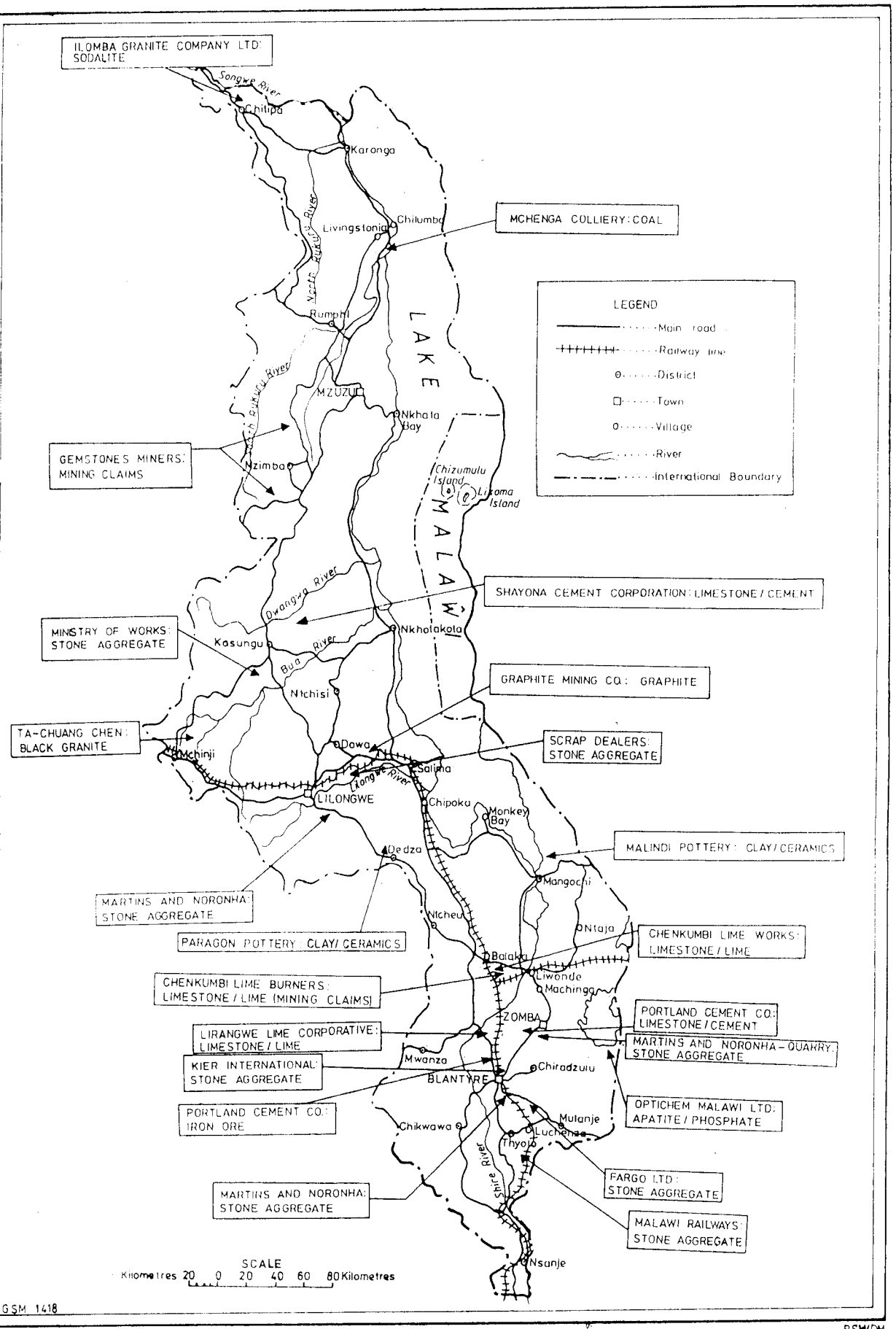


Fig 6 : Mining Concessions

2.2 Exploration Potential

2.2.1 Geochemical Anomalies

Malawi holds enormous potential for the discovery of mineral deposits. Regional geochemical drainage reconnaissance survey prior to 1973 showed anomalies considered to be worthy following up as follows:

Gold

The main sulphide-gold-graphite mineralisation targets are found within the Lilongwe-Kasungu area. The targets are Chisepo, Malingunde South, Kachawa, Kabudula, Chimwala and Nanjiwa, which generally consist of sulphide-bearing magmatic hornblende biotite gneisses and schists. The Geological Survey carried out gold exploration in 1998 in the Kirk Range, Dwangwa and Dzalanyama areas. Gold anomalies were detected along contacts between granitic intrusions and schists. Anomalies were also identified in the Dwangwa area where granitic rocks occur. Other occurrences are associated with sulphide bearing schists within greenstone belts that are enriched in molybdenum.

(i) Some samples from Malingunde hill pyrite deposit showed gold values of about 150 ppb. These were associated with other high values of silver and zinc.

(ii) Some gold was observed from panning at Ndodo dambo around Ndodo village south of Lilongwe.

(iii) Nathenje south of Lilongwe is also another potential exploration target where gold showed in some two streams. High arsenic values were encountered in soils while gold findings were related to pyritic bearing gneiss and schist.

(iv) Alluvial gold was observed in the Dwangwa River and its South bank tributaries. Widespread traces of gold were also found in the central and southwest parts of the area.

(v) In the Kirk Range area, the Lisungwe Valley area is among the notable gold target which is associated with history of placer gold mining and bed rock prospecting within the Manondo zone. Here gold occurrences are associated with pyritized veins in carbonatized schists affected by fracturing and faulting.

(vi) Graphitic pyrite belts in Central Malawi are associated with extensive blankets of gossan and give gravity and magnetic anomalies in areas with low shear zones. Some elevated values of gold and zinc have been noted at Malingunde and Khongoni.

Tin-Molybdenum

(i) Stream samples over an area of 19 km^2 in the Nyika area gave average values of 6 ppm against an average value of 3 ppm. Some values were as high as 15 ppm.

(ii) At Mbale in Nsanje, in an area of about 3 km^2, stream sediments registered molybdenum values averaging 10 ppm against a background of 2 ppm.

Nickel-Copper-Chrome

These mineral associations have been targeted in the Kirk Range-Lisungwe area covering an area of about 3,000 km^2. The area has metamorphic provinces, which are dominated by an ultrabasic-syenite complex. Sulphide occurrences comprising copper and nickel have been recorded in ultrabasic complexes such as Mpemba ultrabasic syenite and Chipilanje-Little Michiru complexes in Blantyre.

Nickel

(i) Values of up to 6,000 ppm nickel in residual soil and 2,000 ppm in bedrock samples at Mpemba hill ultrabasic body were registered.

(ii) High values of up to 6000 ppm of nickel were also registered in rock samples from one flank of Chimimbe hill.

(iii) Other high values of nickel were noted at Chipata hill registering 1,750 ppm and at Chimwale in Kasungu where 250 ppm was registered against a background value of 23 ppm.

Copper

(i) Lulwe area in Nsanje showed some anomaly of about 60 ppm in stream sediments against twice the average background value. Highest values went up to 150 ppm.

(ii) High average value for copper over Chimaliro dome gneiss showed values ranging up to 150 ppm with an average value of 62 ppm in an area of about 204 km^2

(iii) Anomalous sediments occur at Mtondo dambo, South of Lilongwe. Values up to 200 ppm extend nearly 2 km. Background values in stream sediments average 14 ppm.

(iv) Another anomaly at Kampini, within Madziainsa dambo, has up to 1500 ppm copper values in soils. The anomaly extends nearly 3 km.

Niobium and Uranium

(i) Streams draining Chimaliro hill in Rumphi registered niobium values of up to 3000 ppm. Radiometric counts were four times higher than normal. There is a possibility of Uranium pyrochlore mineralisation.

(ii) High niobium values of up to 3000 ppm were registered at Nkhonjera, Rumphi, in pan concentrates obtained from streams draining the southern margin of nepheline gneiss intrusive.

2.2.2 Geophysical Anomalies

The interpretation of geophysical data from a UNDP (1984-85) sponsored Airborne Geophysical Survey has resulted in identifying potential exploration targets. Attractive targets for ground follow up on mineral exploration targets detected by this UNDP sponsored Airborne Geophysical Survey exist in Malawi. The targets were carefully identified using integration of regional geological and geochemical data.

Rare Earths

Within the Chilombe structure strong magnetic susceptibility and a strong Uranium response straddling a major fault cutting across nepheline syenite has been reported.

Kimberlite/Diamonds

UNDP airborne survey has revealed exploration targets for diamondiferous kimberlites in the Mwanza ultrabasic intrusive NE of Nkadana and south of Mtumba fault in Chikwawa. Other targets are the west Chirumba diatreme zone in Karonga and within the Karoo of Livingstonia area in Rumphi. Previous diamond exploration revealed the existence of kimberlite minerals and minute diamonds in concentrate taken from Shire River within the area.

A recent discovery of Kimberlite pipes near Mlowe by the Geological Survey increases the prospects for the existence of pipes, which may be diamondiferous as is the case across the Lake in Tanzania.

Hydrocarbons (Oil and Gas)

Previous seismic and airborne magnetic surveys made over Lake Malawi by Duke University (1981, 1985) and Shell Exploration B.V. (1981) revealed thick sequences of up 3 km of potentially oil-bearing rocks.

2.2.3 Exploration Activities

Geological Survey Department is engaged in a number of exploration and assessment programmes. The activities comprise area-target geological mapping, geochemical and geophysical surveys and deposit assessment. Briefly some of the exploration activities being undertaken are as outlined below:

- Geological search for kimberlite which host diamonds in the Livingstonia and Mwanza areas.
- Gold and platinum metals (PGMs) exploration in the Kirk Range area and Lisungwe Valley areas and gold at Dwangwa in Nkhotakota, Nkhata Bay and Dzalanyama.
- Gypsum exploration in the Lilongwe and Dowa dambos.
- Geological assessment of the graphite resources at Chimutu area in Lilongwe.

Private and local companies are also engaged in exploration activities in various parts of the country for the following minerals: gold, diamonds, copper, titanium, uranium, graphite and coal.

CHAPTER THREE

3.0 Status of the Mineral Sector

Malawi's mining industry is relatively small when compared to other sectors. It consists of quarries for limestone and aggregate, lime and clay works, artisanal gemstone mining and a small coal mine. The contribution of the mineral sector to the GDP is less than 1%.

In an ideal situation investment in mining would be best undertaken by the private sector. This is so because mining is a high-risk enterprise compared to agriculture for example. It demands relatively large capital investment, and often involves long lead times from exploration to production as illustrated in Figure. 7. The nature of the geological uncertainty, the unpredictability of market and prices all involve a gamble that is taken up only if risk investment capital is available. In Malawi, however, the private sector has not been forthcoming to invest in the development of existing mineral resources.

It has to be pointed out that a number of both foreign and local companies have applied for both exploration and mining licences as shown in Table 3. However, due to lack of finance and technology, mineral resources development has not been progressing at a satisfactory pace (GSD and DOM, 1996). Currently there is also no mechanism for promoting investment in the mining industry.

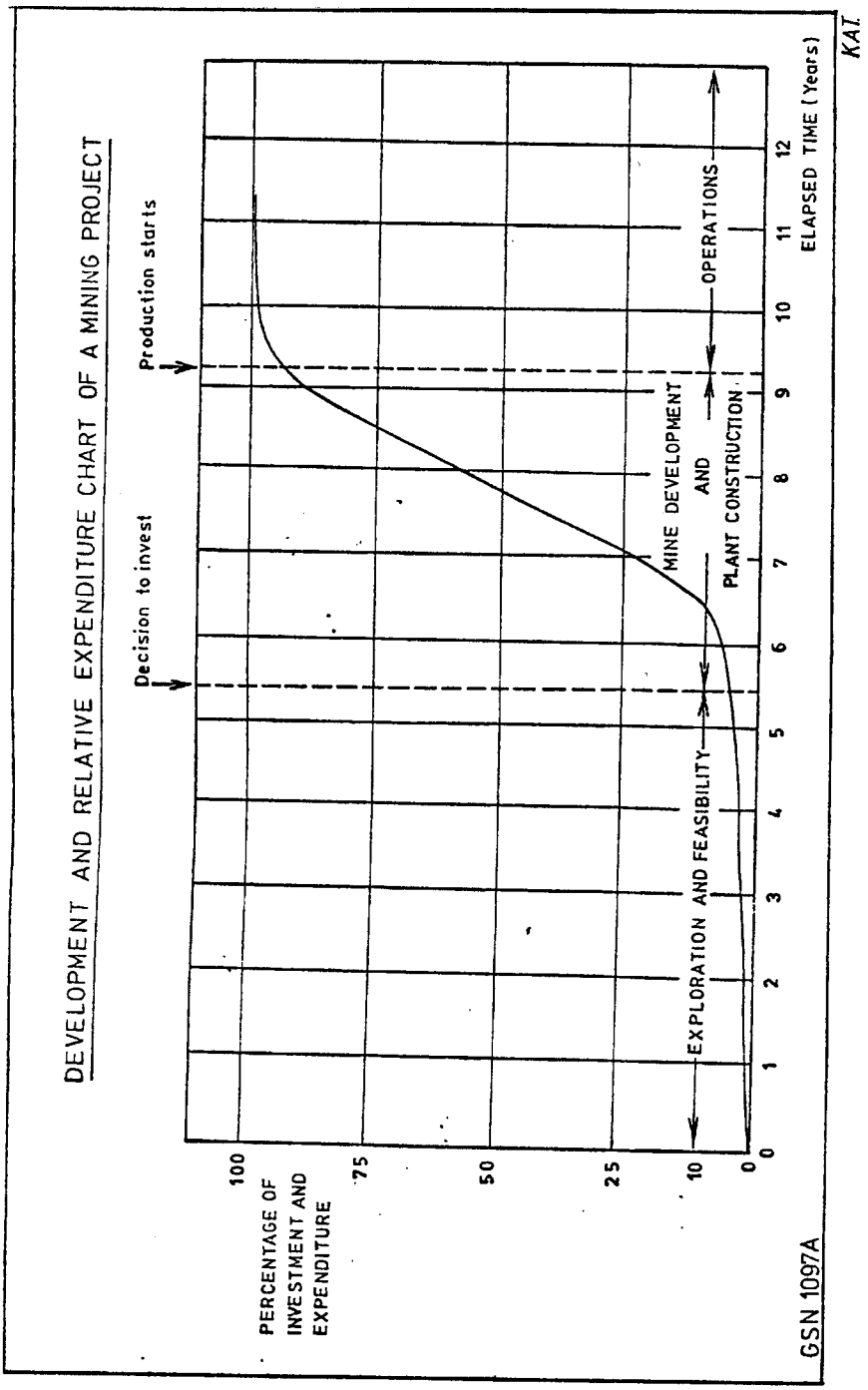


Fig.7: Development and Relative Expenditure of a Mining Project

(After Chatupa, J. 1982)

Generally, foreign companies have not taken interest in the country's largely small deposits. Furthermore on the other hand, the contribution of artisanal mining on mineral development has been insignificant.

Table 3: Licences Issued by end of 1999

Type of Licence	Number issued
Non-Exclusive Prospecting Licence	983
Reserved Minerals Licence	196
Exclusive Prospecting Licence	92
Mining Licence	86
Reconnaissance Licence	19
Mining Claim Licences	201
Total	**1577**

Source: Department of Mines

3.1 Mineral Production

Mineral production in Malawi is small. It mainly consists of industrial minerals (dolomite, cement, lime and stone aggregate), coal and gemstones.

(a) Coal

Coal is mined mainly to substitute for imports. Presently, Mchenga Coal mine being operated by Coal Products Limited is the only coalmine producing about 80% of the country's requirements. Some coal is exported to Tanzania. Figure 8 illustrates the coal production trend since 1994.

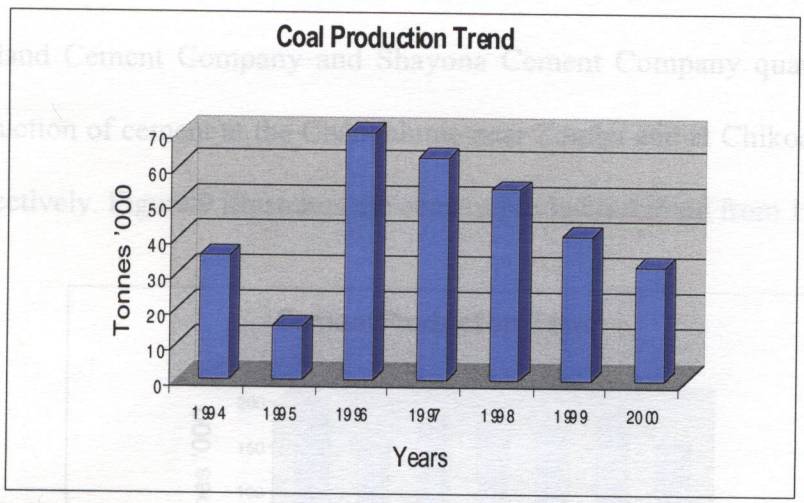


Fig.8: Coal Production Trend

Note: Production for the year 2000 is only up to September

Source: Malawi Annual Mining Economic Report, 2000

As can be noted from the production trend there is fluctuation in coal production. This is largely due to lower mining equipment availability owing to frequent equipment breakdowns and slow delivery of spare parts. Too frequent changes in management has also contributed to this fluctuation. This is evident in 1995 when Mining Investment Development Corporation (MIDCOR), a parastal organisation, decided to sell the mine and stopped producing coal before the year ended. When the mine was finally sold to a consortium of Malawi Development Corporation (MDC) and INDEBANK production picked up again in 1996. The drop in production in subsequent years is attributed to poor maintenance of equipment and general management problems.

(b) Limestone

Portland Cement Company and Shayona Cement Company quarry limestone for the production of cement at the Changalume near Zomba and at Chikoa/Livwezi in Kasungu respectively. Figure 9 illustrates the cement production trend from 1994.

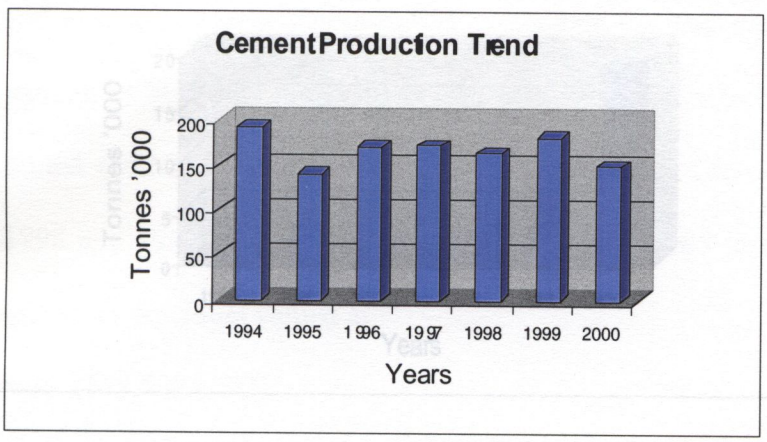


Fig.9: Cement Production Trend

Note: Production for the year 2000 is only up to September

Source: Malawi Annual Mining Economic Report, 2000

Cement production has increased, especially in 1999, due to improved operations after Portland Cement Company undertook its rehabilitation programme of plant equipment and improved methods of quarrying and crushing both at Changalume quarry and Blantyre factory. Another company, Shayona Cement Corporation also contributed to the increase after commissioning their 100 tonnes per day plant at Livwezi in Kasungu.

Limestone is also mined for lime production. Dolomite is mined for use as a filler and as a refractory.

At present, lime is produced manually with antiquated methods, which involve little technology. Figure 10 illustrates the lime production trend from 1995.

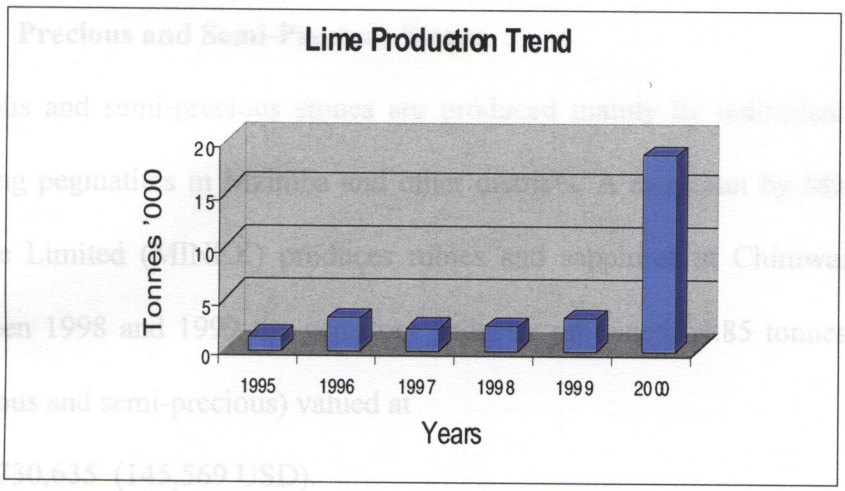


Fig.10: Lime Production Trend

Note: Production for the year 2000 is only up to September

Source: Malawi Annual Mining Economic Report, 2000

The construction of custom built kilns by some lime burners after receiving assistance from USAID under SHARED project and an arrangement which allowed the lime burners to calcine, pack and market their lime through a central marketing point recorded an increase in the amount of lime produced and sold.

A study carried out by Sofremines in 1987, however, suggested that in view of the purity of the limestone, the large reserves available, the many uses of lime that could be supplied in Malawi, there is scope for investigating the possibility of settling up a modern