

MINING

SECTOR PROFILE



ZAMBIA DEVELOPMENT AGENCY



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1.0. OVERVIEW OF THE MINING SECTOR IN ZAMBIA

1.1. Background of the Mining Sector

Zambia has a mining history which spans over ninety years including the late 1960's, when Zambia was the world's third largest copper producer, after the US and the former Soviet Union. Mining was and remains central to the Zambian economy. It has played a key role in the social and economic development of the country.

Zambia has predominantly been a copper mining country being the largest copper producer in Africa. In the 1970's, copper production in Zambia reached its peak (700,000 tons in 1972). Subsequently, falling copper metal prices caused annual production to drop to 200,000 tons in the late 1990's. Recently, the Zambian mining sector has been recovering sharply with the rising prices of metals in the international commodity markets spurred by increased demand for metals from Asia, especially China.

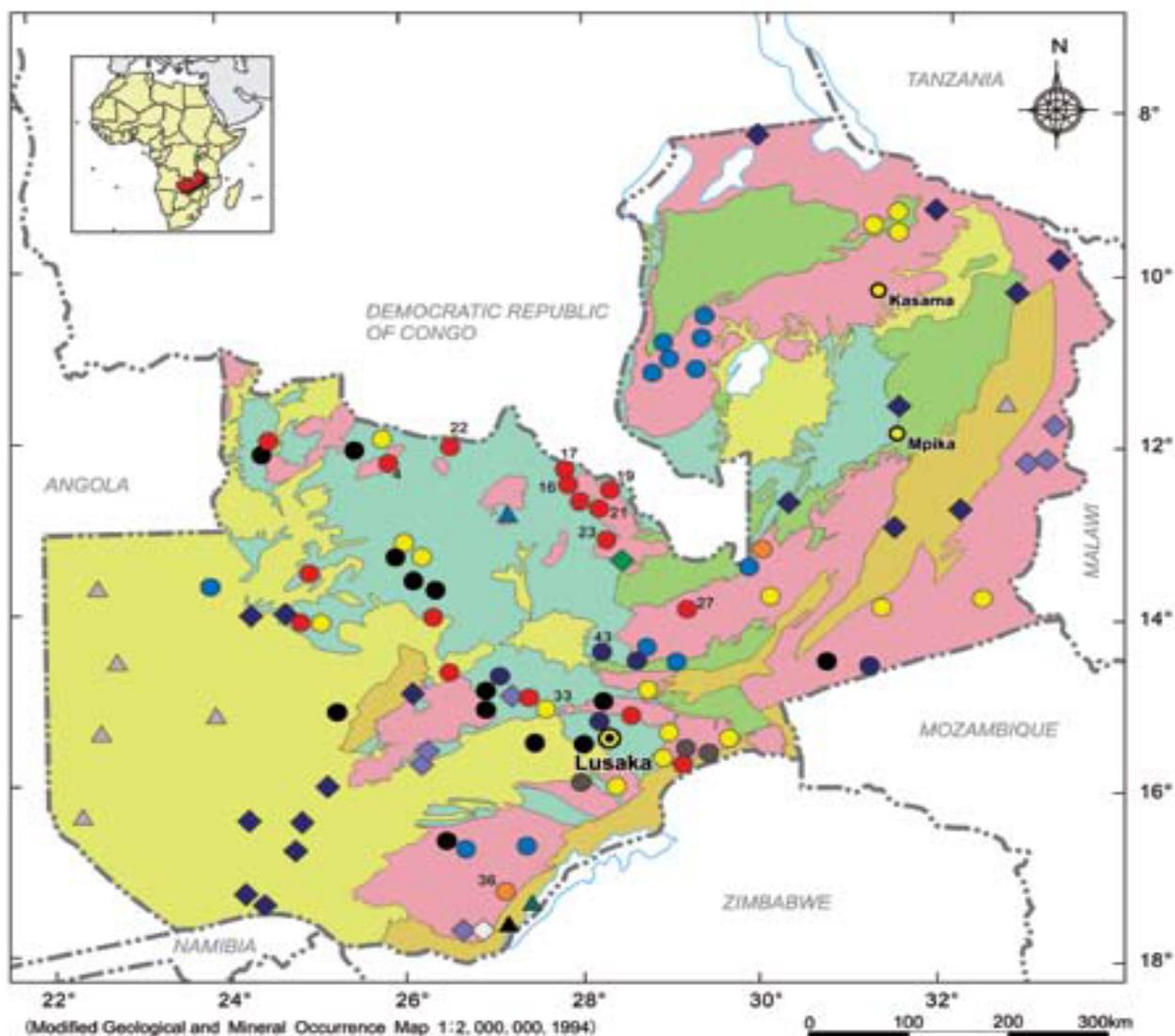
The privatization of Zambia Consolidated Copper Mines (ZCCM) began in 1996, and foreign capital flowed in from investors. Consequently, copper production has increased since 2000, reaching a level of 572,793 tons in 2008 and raising to 697,860 tons in 2009 with a projection that copper production will reach 800,000 tons in 2010.

Zambia's endowment of mineral resources is substantial and the mineral wealth includes metals, gemstones, industrial, agricultural, building and energy minerals. Production of metallic minerals dominates the mining sector. Nevertheless, the full potential of these and other known mineral deposits is yet to be realised creating greater exploration opportunities.

1.2. Geology of Zambia

Zambia comprises a number of very diverse geological terrains ranging from a stable early Proterozoic craton to structurally complex "mobile belts" and younger cover rocks. This diversity hosts the considerable exploration potential of the country. The geological complexities and multiple tectono-thermal events evident in Zambia are due, in large part, to the country's unique geographic location between the massive Kasai Craton to the west and the Zimbabwe-Kaapvaal ('Kalahari') and Tanzania cratons to the south and north respectively. Inter-cratonic dislocations and the buttressing effects of these stable blocks have exerted considerable control on the geological evolution of the country.

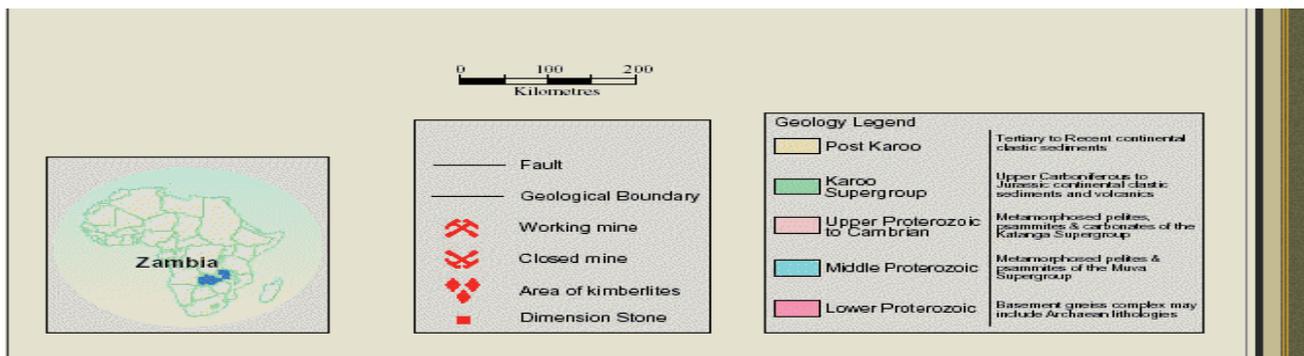
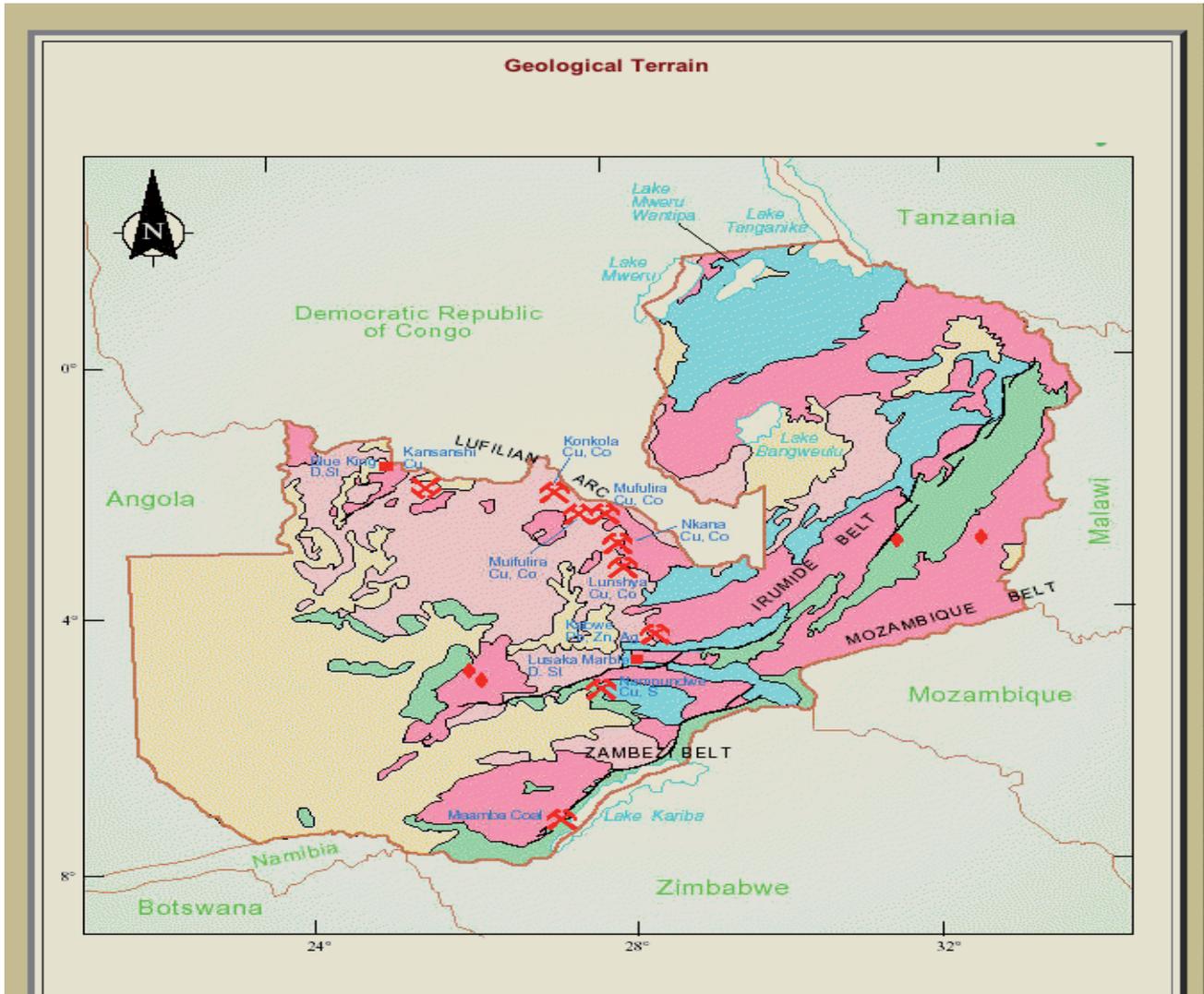
Some 80% of the country has been mapped, although a significant amount of this work is unpublished, including the reconnaissance mapping of the western and north-eastern parts of the country. Regional mapping is carried out at 1:50,000 scale and published at 1:100,000 scale as quarter degree sheets together with a report. There are approximately 260-quarter degree sheets, of which around 60 cover the Kalahari of Western Zambia. Over 100 sheets have already been published and over 60% of the solid geology has been mapped at 1:100,000 scale. Some reconnaissance maps at 1:250,000 are also available. A unique geological map at 1:1,000,000 is available as four separate sheets for easy handling. Prospective investors can view the tenements map showing the locations of exploration and mining licences at the Mines Development Department in the Ministry of Mines and Minerals Development.



LEGEND

	Post Karoo	Tertiary to Recent continental clastic sediments		Copper/Cobalt		Aquamarine
	Karoo Supergroup	Upper Carboniferous to Jurassic continental clastic sediments and volcanics		Gold		Emerald
	Upper Proterozoic to Cambrian	Metamorphosed pelites, psammites and carbonates of the Katanga Supergroup		Lead Zinc		Diamond
	Middle Proterozoic	Metamorphosed pelites and psammites of the Muva Supergroup		Nickel		Coal
	Lower Proterozoic	Basement gneiss complex including Archean lithologies		Tin		Oil, Gas
	Lake			Manganese		Uranium
				Iron		Amethyst

Distribution of Mineral Deposits and Occurrences in Zambia



1.3. Exploration Potential

The complex geological evolution of Zambia together with its abundance and diversity of mineral and other natural resource deposits confirm the considerable potential for discovery of new economic resource occurrences through further exploration. Promising locations are being identified based on empirical models of known deposits and exploration targets are being formulated from other conceptual models. This potential is confirmed by the impressive number of new exploration companies working throughout the country.

The existing mining companies also have short and long term exploration programs to delineate additional resources in the deposits being mined and to discover new ones.

The Bangweulu Block, Kafue Anticline, Irumide Belt, Mozambique Belt, Zambezi Belt, Katangan Terrain, Choma- Kalomo Block, Mwembeshi Shear Zone and the Hook Granite Complex constitute areas with exploration potential for gold, copper-cobalt, uranium, base metals mineralisation and for industrial minerals.

The Karoo sediments in the Luangwa, Zambezi, and Kafue Basins are being targeted to determine their potential for energy minerals and hydrocarbons. These basins are also known to have prospects for oil and gas. The areas have since been demarcated into oil blocks for prospecting.

2.0. INVESTMENT OPPORTUNITIES IN THE MINING SECTOR IN ZAMBIA

Zambia's broad spectrum of mineral resources such as copper-cobalt and gold, gemstones, a variety of industrial minerals and potential energy resources including uranium, coal and hydrocarbons, presents excellent investment opportunities in the extraction and processing of these minerals in the country.

2.1. *Metallic Minerals*

2.1.1. *Gold*

The majority of the deposits are lode-type bodies associated with the Mwembeshi Shear Zone and related syntectonic intrusions. Significant gold mineralisation also occurs, variously with copper and uranium, in major thrust zones near the base of the Katanga succession. More than 300 gold occurrences have been recorded but most are only prospects. Largest historical producers are Dunrobin (990kg) and Matala (225kg) in the Mumbwa area, Jessie (390kg) in the Rufunsa area, and Sasare (390kg) in eastern Zambia.

2.1.2. *Copper and Cobalt*

The copper-cobalt mineralisation is strata bound within arenites, shales, and carbonate rocks of the lower-Katanga Mine Series Group. Copper resources have also been identified in the thrust zones of north-western Zambia, which represent zones of detachment between Basement and Katanga sequences, and in western and central Zambia where shearing and intrusion emplacement through the lower Katanga succession have generated a considerable number of lode, stockwork, breccia and skarn deposits. Other types of deposit include the disseminated copper mineralisation in the granites and aplites of the Mkushi area in central Zambia and copper-bearing stratiform sulphides in the Lusaka area. In excess of one billion tonnes of copper-cobalt ore (c.2.7 % Cu) has been extracted from the mines of the Coppebelt and conservative estimates consider that a further two billion tonnes could be economically exploited.

2.1.3. *Zinc and Lead*

Carbonate-hosted Zn-Pb ore has been mined from the Kabwe deposit in central Zambia where 11Mt of ore averaged close to 25%Zn and 15%Pb. The strata bound mineralisation comprises massive, breccia and replacement sulphides within carbonate rocks marking the transition from

Lower Roan to Upper Roan. Similar styles of mineralisation at the same stratigraphic position, some copper-rich, are evident through the Kabwe area and northwards to Kapiri Mposhi in central Zambia. Stratabound, probably exhalative, Cu-Pb-Zn deposits occur in Basement and Muva sequences in southeastern Zambia. Carbonate hosted Pb-Zn mineralisation has also been recorded in Lower Roan limestones in the Copperbelt and in Lower Kundelungu rocks in western Zambia.

2.1.4. Iron

Substantial resources of iron have been identified, occurring primarily as sedimentary ironstones in the lower-Katanga Mine Series successions of central and western Zambia. Total resources of more than 900Mt with iron content of more than 50% have been provisionally estimated, with some individual deposits up to 200Mt in size. Small, high-grade skarn and replacement deposits are associated with Pan-African felsic and mafic intrusions that have penetrated the lower Katanga succession in western Zambia particularly around the Hook Granite Complex.

2.1.5. Manganese

Occurrences are numerous but mostly small occurring as tabular, probably stratiform exhalative, deposits within Basement and Muva sequences, and supergene enrichments either capping low-grade sedimentary accumulations or concentrated within sub-vertical fractures of limited vertical extent. Currently small scale mining is being done in the Luapula Province in the north of Zambia, around a town called Mansa. Occurrences are also known around central Zambia stretching northwise towards the town of Mansa.

2.1.6. Nickel and Platinum Group Elements

Orthomagmatic nickel occurrences are known in the Basement sequences south and east of Lusaka. Sediment-hosted nickel deposits in Mwashia and Mine Series rocks of north-western Zambia are associated with gabbroic intrusions and often show evidence of hydrothermal enrichment. Also, minor platinum group elements are produced as a by-product of copper refining on the major Copperbelt mines and from the Munali deposit, south of Lusaka.

2.2. Gemstones

2.2.1. Diamonds

Alluvial diamonds have been reported throughout much of north-eastern and western Zambia. Kimberlite and lamproite intrusions occur within and near to the western flank of the Luangwa River and in southern Zambia but no diamond-bearing diatremes have yet been discovered.

2.2.2. Emeralds

Zambia produces about 20% of the world's emeralds and they are sought after due to their deep green colour. The gemstones are recovered exclusively from the Ndola Rural area of the southern Copperbelt where they are hosted by Muva-age talc schists intruded by tourmaline- and phlogopite-bearing pegmatite bodies.

2.2.3. Other gemstones

Aquamarine and tourmaline are mined in the Lundazi and Nyimba areas of eastern Zambia where they occur in pegmatites that were synchronous with the c.486Ma Sinda batholiths. Amethyst is currently being mined in the Mwakambiko Hills near Lake Kariba where it occurs in veins and stockworks generated during late-Karoo or post-Karoo tectonism

2.3. Industrial Minerals

Zambia is host to a range of industrial minerals which will help to support anticipated growth in the mining, manufacturing and agricultural sectors. Feldspars, silica sand, talc, barite, phosphate, limestone clays, dimension stone, graphite, gypsum, kyanite, asbestos, and fluorite are all present.

- **Feldspar** is produced from two alkali-feldspar pegmatite deposits near Siavonga located in the southern part of the country and partially kaolinised pegmatite at Shipingu, near Kapiri Mposhi in central Zambia.
- **Sands** of various specifications occur throughout Zambia but the only occurrence to have been exploited is a deposit of high-quality glass sand at Kapiri Mposhi in central Zambia.
- **Talc** deposits in Zambia have not been extensively evaluated but range from talc derived during metamorphism of dolomites near Lusaka to a hydrothermally altered mafic to ultramafic intrusion, also in the Lusaka area and talc schist occurring in the footwall of copper mineralisation near Ndola.
- A variety of **barite** deposit types are known, the most significant being the vein and replacement bodies hosted by red shales and marls of the Mporokoso Group within the Luongo Fold and Thrust Zone of the Bangweulu Block.
- **Apatite**, the most important potential source of phosphate occurs in significant concentrations in syenitic intrusions (Chilembwe deposit near Petauke in eastern Zambia) and carbonatite bodies (Kaluwe in the Rufunsa-Feira area and Nkombwa Hill at the northern end of the Luangwa Rift).
- **Limestone** and **dolomite** are abundant in the area around Lusaka and these and other deposits in Southern, North Western, Northern, and Luapula Provinces of the country have been identified as being suitable for cement and agricultural use.
- **Clay** deposits. A considerable number of deposits of ball clay and brick clay are known but they have rarely been subjected to bench tests and firing tests. Large deposits of ball clay occur at Solwezi in northwestern Zambia and at Kasanka, 60km north of Serenje in central Zambia. Kaolinite-rich clays have been recorded at Masuku in southern Zambia and near Shiwa Ngandu in Mpika town in northern Zambia. Brick clays are exploited at an artisanal level throughout the country.

2.4. Energy Minerals

2.4.1. Uranium

Three significant types of uranium occurrence have been recorded in Zambia in Karoo sandstones associated with the copper mineralisation of the Copperbelt and structurally controlled mineralisation in the Basement domes of northwestern Zambia. Uranium mineralisation in the Basement domes is variously accompanied by copper and gold and almost invariably occurs in kyanite-bearing schists. These are now known to represent major thrust zones developed along the Basement-Katanga contact and propagated up-sequence both northwards and eastwards e.g. the Lumwana Malundwe deposit in northwestern Zambia. Major exploration activities are underway in southern Zambia as well around the Siavonga area in the Gwembe valley.

2.4.2. Coal

Zambia possesses substantial coal resources and has been producing coal since 1967 from the Maamba mine near Lake Kariba in southern Zambia. The Maamba deposit and other known coal occurrences are confined exclusively to the lower-Karoo Gwembe Formation, within a series of fault-controlled basins that comprise the Mid-Zambezi Rift Valley. Other thin coal seams and carbonaceous shales have been identified in the Gwembe Formation of the Luangwa and Luano-Lukusashi Valleys and in the eastern part of the Barotse Basin in western Zambia.

2.4.3. Hydrocarbons

Historically, the country has had two major exploration programs by Mobil and Placid Oil undertaken between 1986 and 1991 within the Luangwa Rift Valley, one was terminated before intersecting the most favourable reservoir horizons. Considerable thicknesses of littoral and continental sediments underlain by carbonaceous rocks with oil generating potential are present within the Karoo-age graben of both the Luangwa and Mid-Zambezi Valleys. Recent exploration work for petroleum covering parts of North-Western, Western and Eastern Provinces of Zambia, using the Microbial Prospecting for Oil and Gas technique, indicated that the Okavango and North Luangwa basins have potential for oil and gas. Government has tendered the oil blocks for oil and gas prospecting by private sector.

3.0. MARKET ANALYSIS

Zambia is Africa's largest producer of Copper and Cobalt. Although copper production was affected by low copper prices in the late 1990s, Copper production has been increased since 2000. It increased to 572,793 tonnes in 2007 from a low of 256,884 tonnes in 2000, representing an increase of over 100%. The rise in copper production over the years is attributed to investment in rehabilitation of infrastructure and technological innovations in existing mines, the coming on board of new mines and the increase in existing mines, the coming on board of new mines and the increase in small-scale copper mining activities. Copper production has been increasing over the recent past from 575,000 metric tonnes in 2008 to 665,000 metric tonnes in 2009 and to about 700,000 metric tonnes in 2010. This has been due to increased capacity utilisation facilitated by the continued increase in metal prices on the international markets.

4.0. INVESTMENT INCENTIVES IN THE MINING SECTOR IN ZAMBIA

The Zambia Development Agency Act provides for incentives for companies investing substantial amounts in the mining sector in the country. The Act provides for the investment thresholds that investors have to meet in order to qualify for fiscal and non-fiscal incentives. Currently the threshold is; investments of US\$ 500,000 and above qualify for the incentives.

The general investment incentives applicable to the mining sector are;

- Guaranteed input tax claim for five years on pre-production expenditure for exploration companies in the mining sector.
- Any mining company holding a large-scale mining license carrying on the mining of base metals is taxed at 30%. Other mining companies are taxed at 35%
- Dividend paid by a mining company holding a large-scale mining license and carrying on the mining of base metals is taxed at 0%
- Income earned by companies in the first year of listing on the Lusaka stock exchange qualifies for a 2% discount on the applicable company tax rate, however companies with more than 1/3 of their shareholding in the hands of Zambians qualify for a 7% discount
- Duty free importation of most capital equipment for the mining sectors.
- 100% mining deduction on capital expenditure on buildings, railway lines, equipment, shaft sinking or any similar works.
- The debt to equity ratio reduced from 2:1 to 3:1 to encourage further investment in the sector.

5.0. USEFUL CONTACTS OF AGENCIES RESPONSIBLE FOR INVESTMENTS IN THE MINING SECTOR

NAME	ADDRESS	TELEPHONE	FAX	EMAIL
1. Zambia Development Agency (ZDA)	P.O Box 30819, Lusaka	260-211-220177	260-211-225270	zda@zda.org.zm
2. Chamber of Mines in Zambia	P.O. Box 260566, Kalulushi	260-212-730743	260-212-730302	cmz@zamnet.zm
3. Environmental Council of Zambia (ECZ)	P.O Box 51254, Lusaka	260-211-254130 260-211-254023 260-211-254059	260-211-254164	ecz@necz.org.zm
4. Ministry of Mines and Minerals Development (MMMD)	P.O. Box 31969, Lusaka	260-211-235306	260-211-237307	mmmd@zamnet.zm