



ZAMBIA DEVELOPMENT AGENCY

Sub-Sector Profile: Mineral Beneficiation

Industrial Minerals

ZAMBIA: “Africa’s New Frontier for Investments and Profits”



June 2013

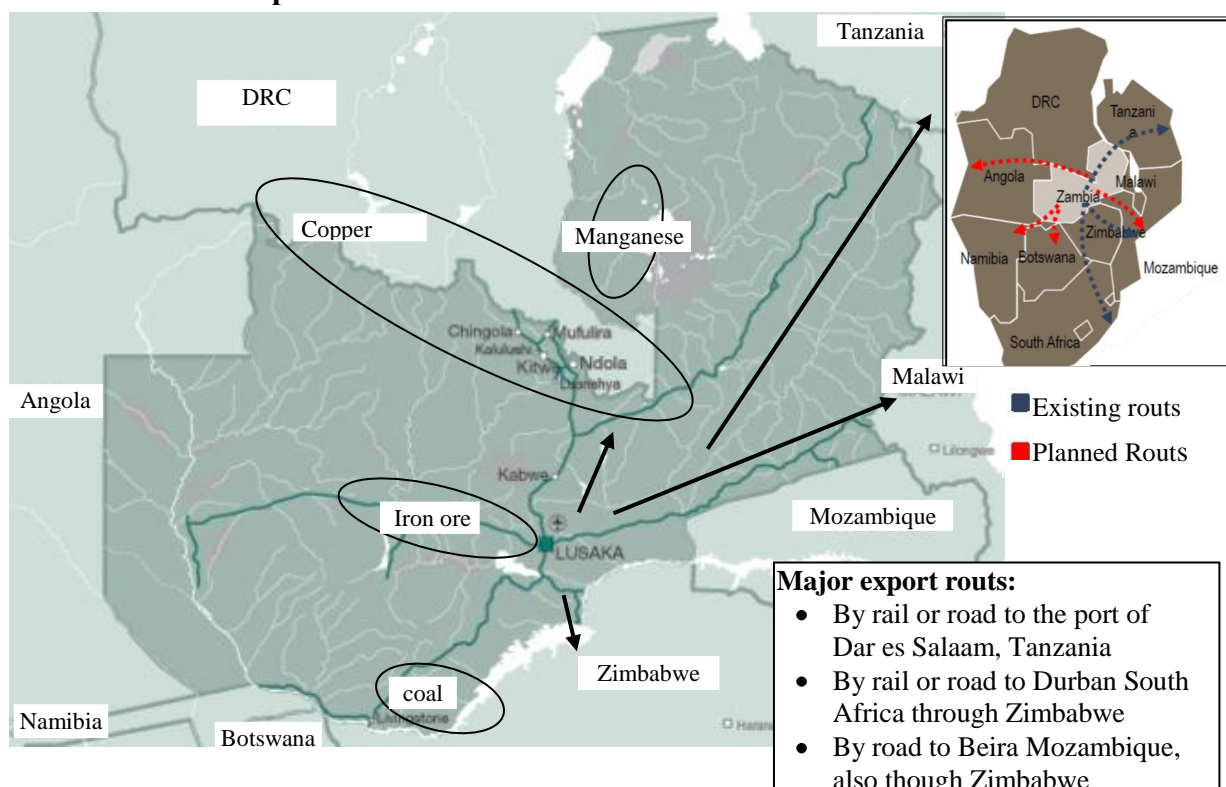
I. OVERVIEW

Located at the centre of southern central Africa, Zambia is a politically stable country with a growing economy; it is in the midst of transforming itself into an economic hub for the rapidly growing central and southern African regions. In Zambia, the sector is the backbone of its economy, contributing 9-10% of GDP. From 2001 to 2009, the mining sector annually grew by 9% and is forecasted to grow from US 590 million in 2000 to US \$ 17 billion by the year 2017. Zambia possesses one of the world's most vital and complex metallotects and is internationally recognized as having a good mineral potential.

Copper is the main mineral resource, accounting for roughly 75% of the country's total export earnings. In Zambia, refined copper is its major export product. The export value of refined copper and copper alloys (unwrought) alone accounts for 63.5 % of its entire trade value. The Zambian Government has been encouraging domestic value-addition of mineral resources by providing generous incentives. Through these efforts, Zambia has established itself as the top producer and exporter of refined copper in Africa.

In addition to copper, there is also a broad spectrum of mineral resources available for further exploration, mining and beneficiation. Additional investment opportunities are especially present in mining and beneficiation of metallic minerals, such as iron, manganese, and uranium, and fuel minerals such as coal. Driven by increased consumption in emerging Asian economies, demands for Zambia's mineral resources are expected to grow further. The combination of strong global demand for minerals, fast-expanding domestic and regional markets, and significant mineral potentials offer exciting investment opportunities.

Map 1. Zambia's Main Roads and Mineral Occurrences



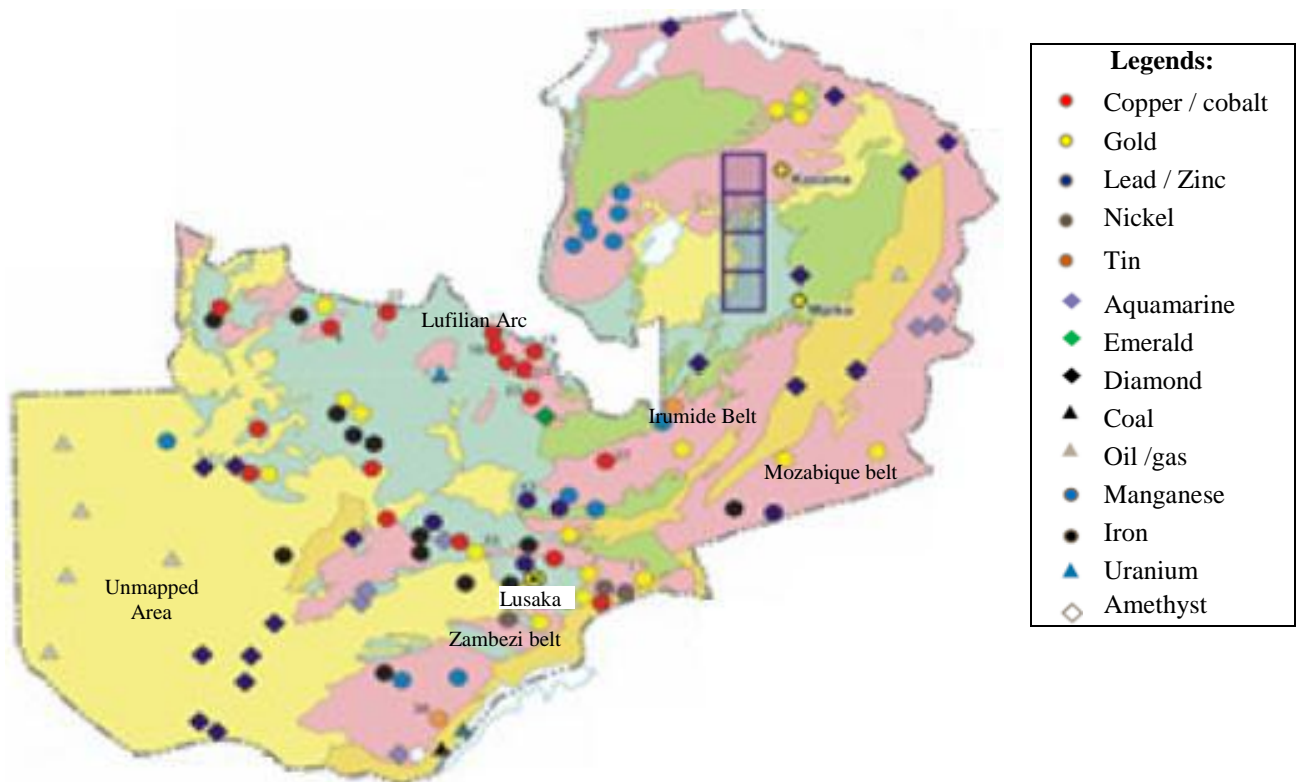
II. THE ZAMBIAN MINING AND MINERAL BENEFICIATION OFFERS...

Abundant Natural Mineral Resources and Huge Potential for Value Addition

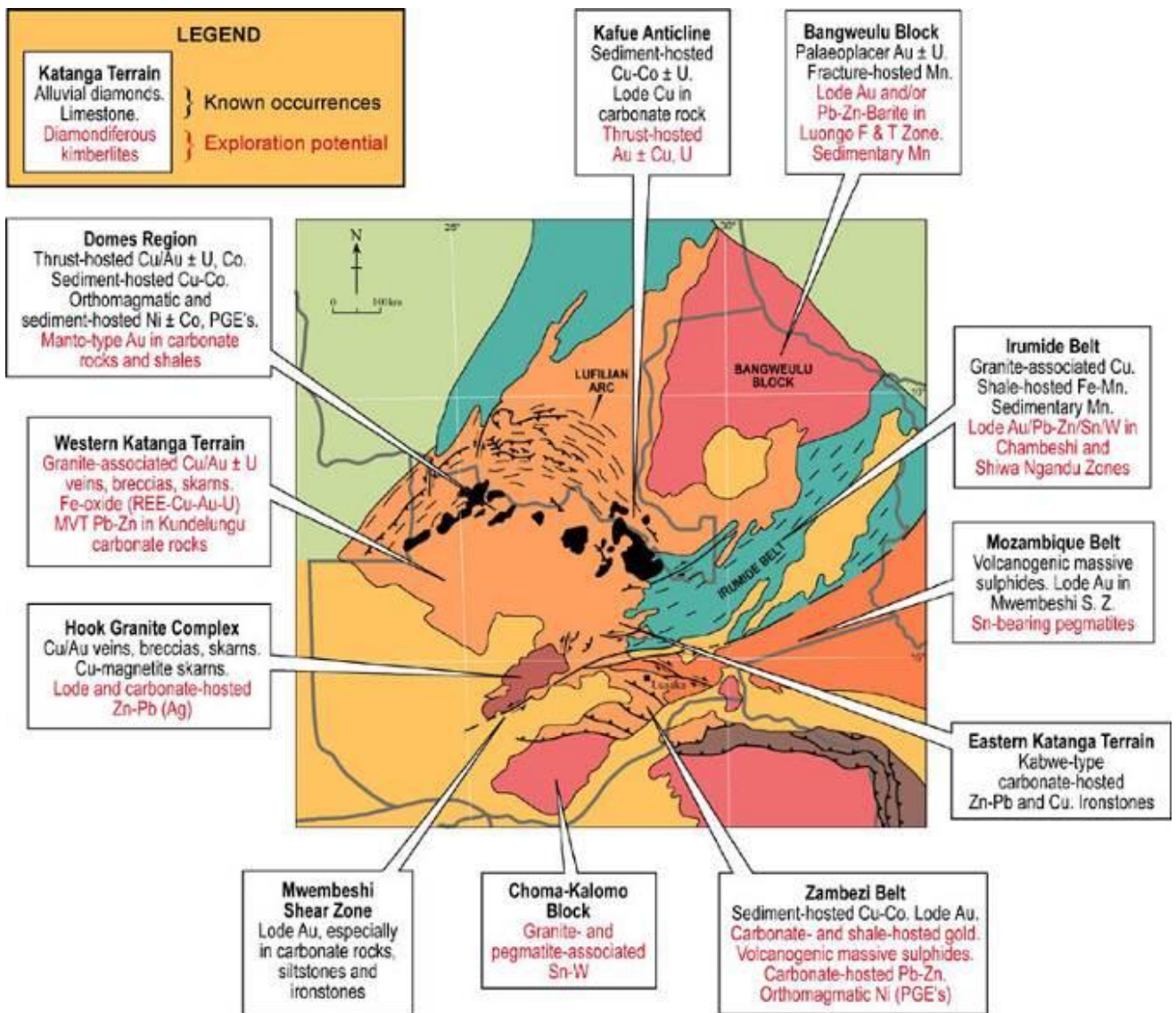
Although 40% of the country has not been geologically surveyed, Zambia is recognized by the international mining industry as having a good mineral potential. The complex geological evolution of Zambia, together with its abundant and diverse minerals and other natural resources deposits that are already known to exist, suggest a considerable potential for the discovery of more new economic resource occurrences. Locations for possible mineral occurrences have been identified, based on empirical models of known deposits, and exploration targets have been formulated from conceptual models.

The Bangweulu Block, Kafue Anticline, Irumide Belt, Mozambique Belt, Zambezi Belt, Katanga Terrain, Choma – Kalomo Block Mwembeshi Shear Zone the Hook Granite Complex constitute areas with exploration potentials for gold, copper- belt, uranium, base metal minimization and industrial minerals (See Maps 2 and 3). The Karoo sediments in the Okvango, Luagwa, Zambezi and Kafue Basins are being targeted to determine their potential for energy minerals and hydrocarbons. The Geological Survey Department (GSD) is already exploring these basins for oil and gas.

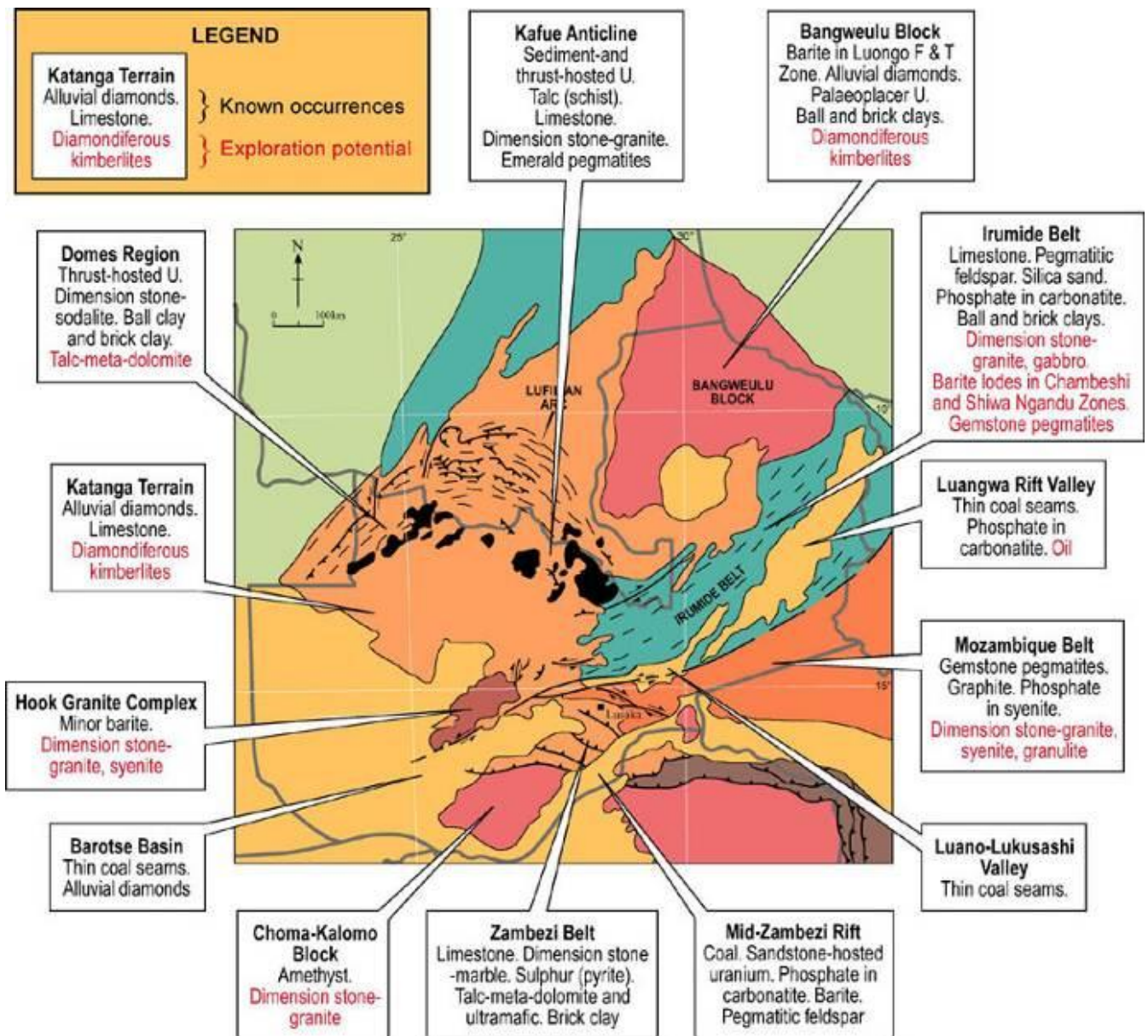
Map 2. Mineral Occurrences and Exploration Potential in Zambia



Map 3: Metal Occurrence Map



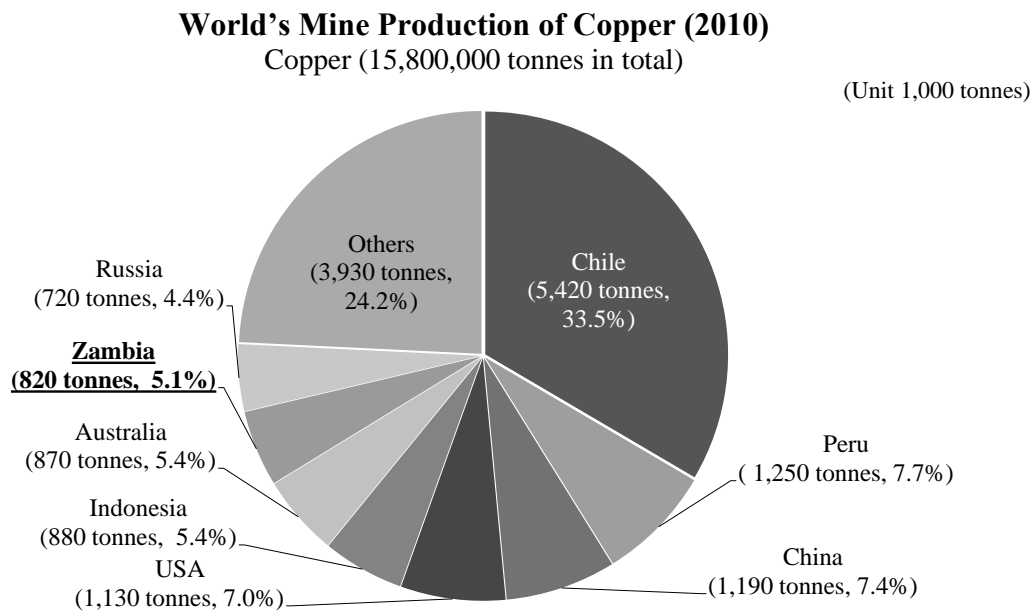
Map 4: Gemstones and Minerals Occurrence Map



1. Metallic Minerals

(1) Copper and Cobalt:

Zambia contains the largest known reserves of copper in Africa, holding 6 % of known copper reserves in the world. Copper ores are mostly found in the Copperbelt region. Resources available to existing mines in Zambia are estimated at 2.8 billion tonnes of copper ores ranging between 0.6 % and 4 % copper. Copper is generally mined together with cobalt. In 2010 Zambia was the seventh producer of copper and the third producer of cobalt in the world in terms of mine production volume; it produced 820,000 tonnes of copper and 5,700 tonnes of cobalt.



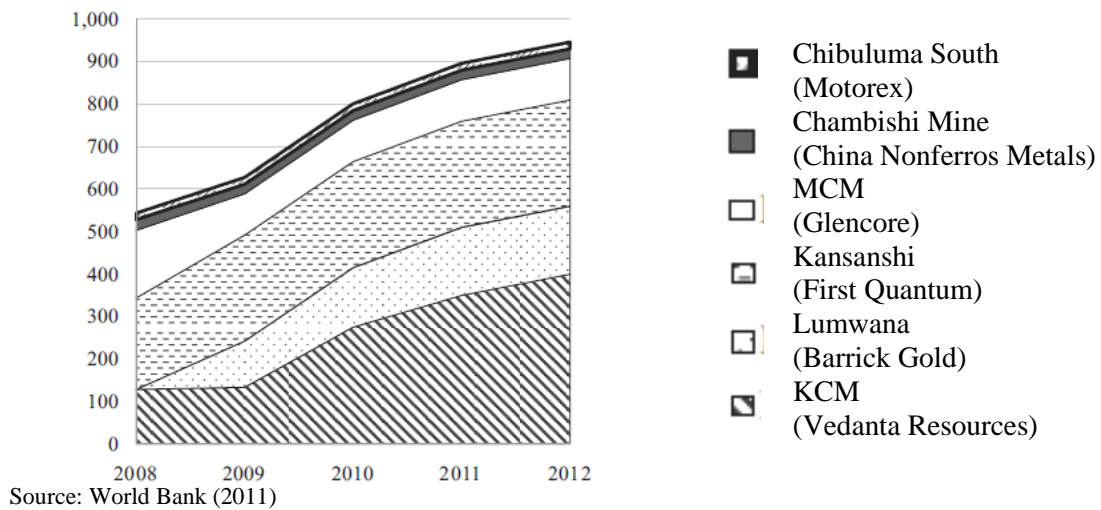
Source: World Mineral Product, British Geological Survey (2006-2010)

One of the main reasons that the copper mining and beneficiation sector is identified as an investment opportunity area in Zambia is that the global demand for copper and cobalt are expected to remain strong. Global demand for copper is expected to grow at around 3 % annually, reaching 25 million tonnes by 2020. Much of the increase will be driven by economic growth and urbanization in emerging economies, especially China and India. Global demand for cobalt is also expected to remain high, especially for the use of battery applications for such products as electric vehicles and hybrid vehicles.

Furthermore, global supply of copper is expected to peak at 20 million tonnes by 2013/14 and decline thereafter. Due to the limited supply and growing demand, the price of copper is likely to remain high, though it will be subject to cyclical fluctuations and periodic, short-term volatility. To meet the shortfall in supply and to take advantage of a high price, the global mining industry is looking to increase investment in copper mining and refining. The mining industry grew 9% annually between 2001 and 2009, and contributes 15-18% of GDP. According to Business Monitoring International, Zambia's mining sector is forecasted to grow from US 590 million to US \$ 1.35 billion by 2015.

Projected Copper Production by Mine, 2008-12

(Unit contained copper thousand tonnes)



The most of copper exported from Zambia, a land-locked country, is refined copper, rather than copper ores or concentrated. The export value of refined copper and copper alloys (unwrought) alone accounts for 63.5 % of its entire trade value. The Zambian Government has been actively encouraging domestic value-addition of minerals (e.g. there is 15% export tax for copper and cobalt concentrates). In addition, Zambia has annual rainfall of 1000mm and rich water resources on and beneath the country (30% of fresh water in SADC Region), a favourable condition to the sector as refined copper in Zambia is produced mainly by the Solvent Extraction-Electro-winning (SX-EW) method, which requires a large supply of water. With its Government's support and conditions that promote domestic value addition of copper, Zambia has established itself as the top producer and exporter of refined copper in Africa. With the increased copper mine production capacity in DRC, coupled with the increasing global demands for copper, there will a greater needs for copper beneficiation and investments in smelting capacity in Zambia.

Mining FDI Inflows 2007-2011

According to the Zambia Development Agency, in the *first three (3) months of 2010*:

- Inward investment (all industries) increased more than six-fold compared to 2009, up from \$195 million to \$1.3 billion;
- Investment in mining was \$500 million, spurred by higher copper prices. (ZDA 2010), and
- Several new mining licenses have been granted in 2009/2010 with the target of achieving 1 million tonnes of copper output by 2012 from a base of approximately 700,000 tonnes in 2009.

Company Profile 1

Copper Mining and Beneficiation Company: Mopani Copper Mines PLC:

Mopani Copper Mines PLC, owned by Carlisa Investments Corporation (a joint venture of a leading global commodity trader Glencore International PLC and First Quantum Mineral Ltd.) and ZCCM-IH, is one of the largest copper and cobalt producer located in the Copperbelt of Zambia. Mopani's operations consist of four underground mines, a concentrator and a cobalt plant in the town of Kitwe and an underground mine, concentrator, smelter and refinery in the town of Mufulira. The capacity of the Mufulira Copper Smelter is being expanded in a phased approach to 870,000 tons of concentrate by the end of 2010. The current capacity with the new Isa smelt furnace is 650,000 tons of concentrate.

Mopani has four SX-EW plants, two at Mufulira and two at Nkana. The feed is sourced from in-situ leaching, vat leaching and heap leaching. Glencore's initial interest was acquired through a subsidiary in 2000 when the Zambian Government privatized the mine.

The primary market destinations of its copper products are Southern Africa, Middle East and Asia and of its cobalt products are Europe, USA and Asia. Employing a total number of 7,600 people, Mopani is contributing to the Zambian economy as well as its employment.



Source: Mopani's Website (Retrieved in 2012)

(2) Iron ores:

Substantial resources of iron ores have been identified, mostly in lower Katanga successions. In Zambia, steel is currently produced using steel scrap. The volume of steel scrap domestically available is not sufficient to sustain the increasing production of steel making in Zambia. The large reserves of iron ores available in the country has been seen as a solution in recent years. There is a new venture planned by a major Zambian steel maker to produce Direct Reduced Iron (DRI or sponge iron) using domestically available iron ores and coals. With the introduction of DRI to Zambia, coupled with burgeoning Zambian industrial and manufacturing sectors and a wider demand throughout central and southern Africa, great investment opportunities lay in iron ore mining and beneficiation.

Company Profile 2

Challenge for Direct Reduced Iron: Universal Mining & Chemical Industries Ltd.

Universal Mining & Chemical Industries Limited (UMCIL) - Kafue Steel Plant plans to implement an Integrated Iron and Steel Plant Project in Kafue. This project is to produce more than 200,000 tonnes of hot rolled steel products per year for both domestic consumption and export using 100% domestic raw materials and energy resources (e.g. coal from Maamba Coal). UMCIL is a wholly Zambian owned company and a subsidiary of the Trade Kings Group, a leading manufacturer of confectionery, beverages and detergent products.

Kafue Steel Plant currently has a capacity to produce 120,000 tonnes of hot rolled long products (e.g., round bars, deformed bars and sections) per year and recently averaging 6,000 tonnes of production per month. UMCIL has been using scrap steel for its production, but the project includes the development of two iron ore mines, which will produce Direct Reduced Iron (DRI) using coal-based rotary kilns. The construction of the first DRI plant started in early 2012. When the feasibility of DRI production in Zambia becomes clearer, investment opportunities in the iron and steel sector in Zambia will enormously increase in all stages of the long production (supply) chains of the iron and steel sector from upstream to downstream.



Source: UMCIL's website (retrieved in 2012) and Interviews to UMCIL by ZDA, (photo: Kafue Plant)

(3) Manganese

Mining of manganese is deemed highly favourable in Zambia, due to the ore's high-grade containment of manganese, ranging between 48% and 54%. The deposits are found in the northern and central parts of the country. From 2005 to 2010, Zambia's export of manganese ores and concentrates drastically increased from 100 tonnes in 2005 to 118,310 tonnes in 2010. Its main exporting partners are China, South Africa, Tanzania and India. In 2010 Zambia ranked the second largest exporter in the SADC region, after South Africa, which is the top exporting country of manganese ores and concentrates in the world. Manganese is alloyed with steel to increase strength, hardness, wear resistance, and other properties and with other metals to form highly ferromagnetic materials. Its demand, therefore, is highly correlated with the demand for iron. As the demand for iron is likely to increase, the demand of manganese is also likely to increase.

In 2012, Taurian Manganese Limited, a private Indian company incorporated in Zambia in 2010, plans to invest US\$250 million in the construction of a manganese processing plant in Serenje. The Plant is planned to process 720,000 tonnes of manganese a year by 2014. Recently, Taurian Manganese Limited obtained six large concessions in Zambia for mining high-grade manganese ores and has started production in Mansa.

(4) Zinc and Lead

Zambia has one of the highest grade zinc and lead deposits in the world, with an estimated 11 metric tonnes of ores containing 40 % combined zinc and lead in Kabwe area. Zinc and lead deposits discovered to date are hosted entirely by carbonate rocks occurring stratigraphically at the Lower Roan-Upper Roan transition. Considerable potential remains in the Kabwe area, and the Katanga-age carbonate sequences northwest of Mumbwa offer a similar potential.

2. Fuel Minerals Available in Zambia

(1) Coal

Zambia possesses substantial coal resources and has been producing coal continuously since 1967. The bulk of the coal has come from the Maamba coal mine, an open-cast operation in the southern part of the country near Lake Kariba. Coal is mined at Maamba with estimated coal reserves of 65 million tonnes. Coal resources are most likely to be found in: the fault bounded Karoo basins of the Mid Zambezi Rift, particularly in the Mulungwa Coalfield, the area between the Mulungwa and Siankondobo Coalfields, and in the Siambabala area, the Luangwa and Luano Valleys.

Company Profile 2

Coal Mining Company: Maamba Collieries Limited (MCL)

Coal mining in Zambia has been expanding with the recent changes in the ownership of the largest producer of coal in Zambia, Maamba Collieries Limited (MCL). In 2010, Nava Bharat (Singapore) Pte Ltd. (NBS) (a subsidiary of Nava Bharat Ventures Ltd. of India) acquired 65% equity stake in MCL from ZCCM-Investment Holdings Plc (ZCCM-IH). The mine was recently re-opened after having undergone modernization, which included rehabilitation of the main road and installation of an ultra-modern coal processing plant module. MCL is currently developing an integrated coal and power project, in order to supplement the growing demand of electricity in the region and effectively utilize low grade coal. Nava Bharat and ZCCM-IH have committed their financial and managerial support to the project not only for the first phase of 300 MW but also for the second phase of another 300MW of power generation.



Source: MCL's Website (Retrieved in 2012),

(2) Uranium

Zambia has uranium deposits in various geological formations, most importantly in sediments of the Karoo basin that covers a large part of South Africa. Mineralization has been identified in parts of the Copperbelt region and southern regions of the country. The Zambian Government aims at becoming Africa's third biggest supplier after Namibia and Niger. In October 2008, Zambia enacted a new law on the mining, storage and export of uranium. This new law will benefit the fledgling uranium sector in Zambia, setting the legal framework for uranium mining in the country. Some explorations are already underway. For example, Barrick Gold Corporations' Lumwana copper project is undergoing a feasibility study on uranium exploration. Dension Mines is exploring its Mutanga uranium project in southern Zambia with mine production plan to start in 2012.

(3) Oil and Gas

In 2006 Zambia announced its first discoveries of oil and gas reserves. The discoveries were made in western part of the country, near the border with Angola, already a major oil exporter. Further geological surveys were conducted in 2007, confirming traces of oil in the north-western, western, and eastern parts. In 2009, the Government issued an international tender to explore 23 blocks. At the same time, it also revised the Petroleum Production and Development Act and is currently working on new regulations for the monitoring and supervision of the sector.

3. Other Industrial Minerals Available in Zambia

Zambia hosts a range of industrial minerals that will support an anticipated growth in the mining, manufacturing and agricultural sectors. The non-metallic minerals available in Zambia include: limestone, cement, clays, surfur, silica sand, feldspars, talc, barite, phosphate, dimension stone, graphite, gypsum, kyanite, asbestos and fluorite. Especially, limestone and dolomite are abundant in the area around Lusaka. These and other deposits in Southern, North Western, Northern and Luapula Provinces have been identified as being suitable for agriculture use.

4. Precious Metals and Stones

The mining opportunities also exist in exploration of such precious stones as emeralds, gold amethyst, aqua-marine, and diamonds. Zambia has the second largest deposit of emeralds in the world, comprising 20 % of the world supply. Zambian emeralds are among the best and are preferred for their deep green crystal colour.



III. INVESTMENT OPPORTUNITIES

Based on the current conditions of Zambia's mining and mineral beneficiation sector, exciting investor opportunities have been identified in the following areas:

1. Copper mining and beneficiation, especially in setting up copper smelting and refinery facilities, with the country's current shortfall standing at 300,000 tonne per year;
2. Iron mining and beneficiation to supply for the iron demands of burgeoning domestic and regional markets;
3. Manganese mining and processing for exports. Exports markets include South Africa, Switzerland, Belgium, and the DRC;
4. Providing mining support services (in particular, machinery) for the mining sector, and
5. Joint-ventures with existing small-scale operators or in green fields investments in gemstone mining and processing (emeralds, amethyst, aquamarine, tourmaline, garnets and beryl).

IV. INVESTING IN ZAMBIA'S MINING AND MINERAL BENEFICIATION SECTOR

Investors interested in the mining and mineral beneficiation sector should contact the Zambia Development Agency (ZDA) for fiscal, non-fiscal and facilitation services. ZDA will provide information on relevant policies, taxes and incentives and assist registered investors to fulfil other related procedures in connection with their establishment, such as acquiring land, obtaining water and electric power and communication services, and regularizing their immigration status. Basic information on policies, taxes and incentives related to the mining and mineral beneficiation sector are as follow:

1. Policies

The Zambian Government has adopted a mineral policy designated to increase investments in the mining sector and ensure its transition to a self-sustaining mineral-based industry. All exploration and mining activities are governed by the Mines and Minerals Act of 2008. Other mining relation regulations include: Mineral Royalty Tax (Repeal) Act, Petroleum (Exploration and Production Act), Explosives Act, and Environmental Protection and Pollution Control Act.

Joint Venture: Suggested Form of Establishing a Business in Zambia

When starting a business in Zambia, companies are required to be incorporated under the Zambian Laws. Mining exploration would require the company to have prospecting license, which can be obtained directly from the Ministry of Mines and Mineral Development through a Joint Venture (JV) with an existing company holding such a license. It is easier through a JV as opposed to directly through the Ministry because most areas are already under license.

2. Tax

Zambia's tax favours mining corporate tax for mining companies. The table below summarizes Zambia's tax regimes for the mining and mineral beneficiation sector (See also "Incentives").

Tax	Rate	Explanation
Mineral royalty	3%	Gemstone, small scale artisan mining license
	6%	A royalty is payable calculated as 3% of the market value of minerals f.o.b. less the cost of smelting, refining* and insurance, handling and transport from the mining area to the point of export or delivery within Zambia. Royalty payments may be deferred if the cash operating margin of a holder of a large-scale mining license falls below 0. * The Zambian Government actively promote value addition of minerals to be conducted domestically through various tax deductions.
Corporate tax	35%	General rate
	30%	Any mining company holding a large-scale mining license carry on the mining of base metals is taxed at 30%.
	10%	On income from non-traditional exports
Personal income tax	0%	On income from zero (0) to K 2,000,000
	25%	On income from K2,000,001 to K 2,800,000
	30%	On income from K 2,800,001 to K 5,700,000
	35%	On income above K 5,700,000
Value added tax (VAT)	16%	VAT is generally levied at 16%. A holder of a mining rights is exempt from customs, excise and VAT duties in respect of all machinery and equipment required for exploration or mining activities
Export tax	15%	This applies to copper and cobalt concentrates .
Import duties	Varies (0-40%)	Import duties are charged on specific items and they duty varies between 0-40 %.
Withholding tax	15%	The following are charged a withholding tax of 15% <ul style="list-style-type: none"> • Interest, dividends, royalties, rent income and management and consultancy fees, • Payments to non-residents entertainers and sports persons; • Payment to non-resident contractors; and • Commission paid to non-employees

3. Incentives

(1) General Incentives Applicable to the Mining and Mineral Beneficiation Sector

- (a) **Corporate tax:** Income earned by companies in the first year of listing on the Lusaka Stock exchange qualifies for a 2% discount. Companies with more than one third of their shareholding in the hands of Zambians qualify for a 7% discount.

- (b) **Carry forward losses**
 - Copper and cobalt mining: 10 years
 - Other mining and non-mining: 5 years
- (c) **Value added tax (VAT)**
 - Relief for VAT registered enterprises on imports eligible capital goods (VAT deferment)
 - Zero rate of export of taxable products;
 - Relief of VAT on transfer of business as a going concern;
 - Equal treatment of services for VAT-reserve VAT
 - Cash accounting for specialized associations e.g. association of building and civil engineering contractors;
 - VAT relief on input tax paid for purchases made by registered suppliers;
 - Input tax claim for three months prior to VAT registration for businesses that have already commenced trading, and
 - Reduction VAT rate for investors in tax free zones.
- (d) **Import duty:** Duty-free importation of machinery and equipment (including specialized motor vehicles) for use in exploration or mining;
- (e) **Capital allowance**
 - Plant and machinery: 25%
 - Non-commercial vehicles: 20%
 - Industrial buildings: 5%
 - Commercial building: 2%
 - Improvement allowance under the ZDA Act: 100%
 - Lease plant, machinery and implements: 50%
- (f) **Wear and Tear allowance:** building used for manufacturing and mining qualify for wear and tear allowance of 10 % of cost in first year and 5 % of cost per year in subsequent years.
- (g) **Initial allowance:** Initial allowance of 10% on capital expenditure incurred on the construction or improvement of an industrial building is deductible.
- (h) Foreign exchange losses of capital of a capital nature incurred on borrowings used for the building and construction of an industrial or commercial building are tax deductible.

(2) Additional Incentives Based on the ZDA Act

Investments in Zambia are regulated by the Zambia Development Agency Act No. 11 of 2006 (ZDA). ZDA offers a wide range of incentives in the form of tax incentives, no fiscal incentives, exemptions and concessions for companies. The Act provides for investment thresholds that investors have to meet to qualify for fiscal and non- fiscal incentives. There are five categories of investors who can be considered under the ZDA.

(a) **Investors who invest not less than US\$500,000 in the Multi Facility Economic Zones (MFEZ) and/ or in a sector or product considered as a priority sector or product.** This category of investors are entitled to the following special incentives, in addition to the general incentives:

- 0% tax rate on dividends for five years from year of first declaration of dividends;
- 0% tax on profit for 5 years from the first year profits are made; for years 6 to 8, only 50% of profits are taxable; and for 9 and 10, only 75 % of profits are taxable;
- 0% import duty rate on raw materials, capital goods, machinery including trucks and specialized motor vehicles for five years, and
- Deferment of VAT on machinery and equipment including trucks and specialized motor vehicles.

Priority products or sectors related to the mining and mineral beneficiation are:

- (1) Manufacturing of copper products, iron ores and steel, cobalt and other value-added activities to base metals to produce finished products;
- (2) Beneficiation of phosphates and any other related materials into fertilizer, and
- (3) Beneficiation of rock material into cement.

(b) **Investors qualifying as micro or small enterprises under the ZDA Act;** aside from the applicable general incentives, the following additional benefits are provided:

- For an enterprise in an urban area the income shall be exempt from tax for the first three years, and
- For an enterprise in a rural area the income shall be exempt from tax for the first five years.

(c) **Investors who invest less than \$500,000 in a sector or product provided for as a priority sector or product;** these investors are only entitled to general incentives.

(d) **Investors who invest any amount in a sector or product not considered a priority sector or product;** these investors are only entitled to general incentives provided under the various pieces of registration.

(3) Other Incentive

- Dividend paid by a mining company holding a large- scale licence and carrying on the mining of base metals is taxed at 0%.
- 100% mining deduction on capital expenditure on buildings, railway lines, equipment, shafts sinking or any similar works.
- The debt/ equity ratio has been reduced from 2:1 to 3:1 to encourage further investment in mining.

**APPENDIX 1. LIST OF COMPANIES ENGAGED IN COPPER AND COBALT
MINING AND BENEFICIATION (2013)**

No.	Major operating companies and major equity owners	Location of main facilities	Annual capacity (1,000 tons)
[Copper and Cobalt : Ore and Concentrate]			
1	<u>Lumwana Mining Company Ltd.</u> (Equinox Minerals Ltd., 100%)	Lumwana Mine (Malundwe pit)	20,000 ore
2	<u>Kansanshi Mining plc</u> (Kansanshi Holdings Ltd. [subsidiary of First Quantum Minerals Ltd.], 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Kansanshi Mine, north of Solwezi	12,000 sulfide ore 6,000 oxide ore
3	<u>Konkola Copper Mines plc</u> (Vedanta Resources plc., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Chingola open pit A and Nchanga open pit, Chingola	4,500 ore
		Nchanga underground mine, Chingola	2,800 ore
		Konkola Mine, Chililabombwe	2,400 ore
		Fitwaola open pit, Chingola	NA ¹
		Reprocessing material from the TD3a, the TD3b, the TD5, and the TD7 tailings dams, Chingola	NA
4	<u>Mopani Copper Mines plc</u> (Carlisa Investments Corp*., 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 10%) *Carlisa Investments Corp. is owned by Glencore International AG, 81.2%, and First Quantum Minerals Ltd., 18.8%.	Nkana Mine, includes the Central, the Mindola North, the Mindola Sub-vertical, and the South Ore Body shafts for underground operations, and the Area A, the Area E, and the Mindola open pits	5,500 ore
		Mufulira Mine	2,500 ore
5	<u>CNMC Luanshya Copper Mines Ltd.</u> (NFC Africa Mining plc, 100%)	Baluba underground mine	1,800 ore
6	<u>NFC Africa Mining plc</u> (China Nonferrous Metal Mining Corp., 85%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 15%)	Chambishi Mine	800 ore, which yields about 50 copper in concentrate
7	<u>Chibuluma Mines plc</u> (Metorex Ltd., 85%, and Zambia Consolidated Copper Investments Holdings Plc, 15%)	Chibuluma South Mine, about 20 kilometers from Kitwe	600 ore, which yields about 18 copper in concentrate. ²
8	<u>Albidon Ltd.</u>	Munali nickel mine, about 60 kilometers south of Lusaka	1,200 ore, which yields about 1.7 copper and 0.5 cobalt coproduct

¹ Operations suspended. Facility on care-and-maintenance status. ² Also include some cobalt content

No.	Major operating companies and major equity owners	Location of main facilities	Annual capacity (1,000 tons)
[Copper and cobalt: Metal]			
1	<u>Konkola Copper Mines plc</u> (Vedanta Resources plc., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Tailings leach plant at Chingola	80 copper cathode
		Nchanga copper smelter, Chingola	311 copper anode (blister copper) 3 copper-cobalt alloy
		Nkana copper smelter	240 copper anode (blister copper) ¹
		Nkana copper refinery, Kitwe	300 copper cathode
2	<u>Mopani Copper Mines plc</u> (Carlisa Investments Corp.*, 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 10%) *Carlisa Investments Corp. is owned by Glencore International AG, 81.2%, and First Quantum Minerals Ltd., 18.8%.	Mufulira in situ leach and solvent extraction-electrowinning plant ²	17 copper cathode
		Mufulira (ISASMELT) smelter	200 copper anode
		Mufulira refinery	275 copper cathode
		Nkana solvent extraction plant	15 copper cathode
		Nkana cobalt plant	2.4 cobalt metal
3	<u>Chambishi Metals plc</u> (Eurasian Natural Resources Corporation PLC (ENRC), 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 10%)	Chambishi cobalt plant	27 copper cathode 3.4 cobalt metal
4	<u>Chambishi Copper Smelting Company, Ltd.</u> (China Nonferrous Metal Mining (Group) Company Ltd., 60%, and Yunnan Copper, 40%)	Chambishi copper smelter	150 copper anode (blister copper)
5	<u>First Quantum Mining and Operations Ltd.</u> (First Quantum Minerals Ltd., 100%)	Bwana Mkubwa solvent extraction-electrowinning plant, near Ndola	52 copper cathode
6	<u>Sable Zinc Kabwe Ltd.</u> (Metorex Ltd., 100%)	Sable copper leach and electrowinning plant at Kabwe	14 copper cathode, 0.6 cobalt carbonate
7	<u>Sino-Metals Leach Zambia Ltd.</u> (China Nonferrous Metals Mining Co. Ltd., Sino-Africa Mining Investments Ltd., NFC Africa Mining Plc, and China Hainan Construction Co. Ltd.)	Chambishi	8 copper cathode
8	<u>Kansanshi Mining plc</u> (Kansanshi Holdings Ltd. [Subsidiary of First Quantum Minerals Ltd], 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Kansanshi high-pressure leach and solvent extraction-electrowinning plant	250 copper cathode

¹ Operations suspended. Facility on care-and-maintenance status.

² Closed in 2009

Source: 2010 Minerals Yearbook, U.S. Geological Survey, US Department of Interior

Notes about Copper Mining and Beneficiation Sector

Anode: The positive terminal in an electrolytic cell where electrons leave a device to enter the external circuit. A copper anode at 99 % purity will dissolve.

Blister: The product of a converting furnace. It is an intermediate, more concentrated (with respect to the desired metal) material than matte, from which it is made, and is usually transferred to another furnace for further concentration.

Cathode: The negative terminal in an electrolytic cell where copper is plated during electrowinning or electrolytic refining. Copper so plated is referred to as “cathode” and is generally about 99.99 % pure.

Contained Copper: Contained copper is defined as the analytical amount of copper outputted in concentrates and precipitates.

Copper concentrate: A product of flotation milling. It composes sulfide minerals and entrained material and contains one - third each copper, iron, and sulfur. It can be processed pyrometallurgically in a smelter to produce matte or hydrometallurgically (pressure leaching) to produce pregnant leach solution, both products requiring further processing to obtain copper metal.

Direct melt scrap: Direct melt, or Re-melt scrap is secondary material that can be used directly in a furnace without cleanup through the use of fluxes and poling and re - refining.

Electrorefining: An electrolytic refining process where less pure copper anode are dissolved, and high - purity copper is plated at the cathode.

Electrowinning: An electrolytic refining process where the anode is inert, and rich (copper - loaded) electrolyte continually replaces lean (copper - depleted) electrolyte as copper is plated at the cathode.

Primary copper: Copper extracted from ores and recovered as copper metal or copper - bearing chemicals.

Solvent extraction: A method of separating one or more metals from a leach solution by treating with a solvent that will extract the required metal, leaving the others. The metal is recovered from the solvent by further treatment

**APPENDIX 2. LIST OF COMPANIES ENGAGED IN
MINING AND BENEFICIATION OF OTHER MINERALS (2010)**

(Metric tons unless otherwise specified)

Major operating companies	Location of main facilities	Annual capacity
[OTHER METALLIC MINERALS]		
[Iron and Steel: Crude Steel]		
Universal Mining and Chemical Industries Ltd. (Trade Kings Group).	Lumwana Mine (Malundwe pit)	100,000
[Manganese]		
Small-scale miners	Mansa area, Luapula Province and Mkushi area, Central Province	120,000
[Nickel, Ni content of Ore]		
Albidon Zambia Ltd. (Albidon Ltd., 100%)	Munali Mine, about 60 kilometers south of Lusaka	10,500
[Lead, metal, secondary]		
Pagrik Zambia Ltd. (Gravita Group, 100%)	Lusaka	1,000
[MINERAL FUELS]		
[Coal, Bituminous]		
Maamba Collieries Ltd. (Nava Bharat consortium, 65%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 35%)	350 kilometers south of Lusaka in the Kanzie and the Izuma Basins	NA
Collum Coal Mining Industries Ltd.	Near Sinazongwe	240,000
[Petroleum, Refined]		
Indeni Petroleum Refinery Ltd. (Government, 100%)	Indeni refinery at Ndola	3,500,000 (42-gallon barrels)
[INDUSTRIAL MINERALS]		
[Lime, Quicklime]		
Ndola Lime Company Ltd. (Zambia Consolidated Copper Mines Investment Holdings Plc, 100%)	Ndola	300,000*
[Cement]		
Lafarge Cement Zambia plc (Pan African Cement Ltd. [Subsidiary of Lafarge S.A.], 50%, and Financiere Lafarge S.A. [Subsidiary of Lafarge S.A.], 34%)	Chilanga II plant, about 15 kilometers south of Lusaka	830,000
	Ndola plant	450,000.
	Chilanga I plant, about 15 kilometers south of Lusaka	200,000.
Scirocco Enterprises Ltd.	About 18 kilometers southwest of Lusaka	100,000
Zambezi Portland Cement Ltd.	Ndola	330,000
[Sulfur, Pyrite ore]		
Konkola Copper Mines plc (Vedanta Resources Finance Ltd., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Nampundwe Mine, 48 kilometers west of Lusaka	300,000** gross weight
[Sulfur, Sulfuric acid]		
Konkola Copper Mines plc (Vedanta Resources Finance Ltd., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Nchanga acid plant	675,000
First Quantum Minerals Ltd.	Bwana Mkubwa acid plant, near Ndola	350,000
[PRECIOUS MINERALS]		
[Gold, content of ore]		
Kansanshi Mining plc (Kansanshi Holdings Ltd., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc, 20.6%)	Kansanshi Mine	3,200 kg

* Plant has the capacity to produce up to 5,000 metric tons of hydrated lime (slaked) from quicklime.

** Operations suspended. Facility on care-and-maintenance status.

Source: 2010 Minerals Yearbook, U.S. Geological Survey, US Department of Interior

APPENDIX 3. ESTIMATED PRODUCTION OF MINING COMMODITIES (2010) ^{1, 2}

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010
[METALLIC MINERALS]					
Copper: ³					
Mine output, Cu content:					
By concentration or cementation	350,000 ^r	341,000 ^r	392,000 ^r	554,000 ^r	670,000
Leaching, electrowon	124,000	168,000	163,000	140,000 ^r	150,000
Total	474,000 ^r	509,000 ^r	555,000 ^r	694,000 ^r	820,000
Metal, smelter, primary, includes low-grade electrowon	290,000	224,000	232,000	330,000	490,000
Refinery, primary:					
Electrowon	178,000	200,000	175,000	145,000 ^r	160,000
Other	240,000	230,000	267,000 ^r	290,000 ^r	370,000
Total	418,000	430,000	442,000 ^r	435,000 ^r	530,000
Cobalt:					
Mine output, Co content	8,000	7,500	7,000 ^r	4,900 ^r	5,700
Metal, Co content	4,665 *	4,335 ^{*r}	4,049 ^{*r}	1,271 ^{*r}	1,092 *
Iron and steel, crude steel	--	--	--	10,000	40,000
Manganese:					
Gross weight	--	2,000 ^r	55,000 ^r	40,000 ^r	120,000
Mn content	--	644	17,000 ^r	13,000 ^r	40,000
Nickel, Ni content of concentrates	--	--	750	280	2,809 *
Lead, metal, secondary	1,000	1,000	1,000	1,000	1,000
[MINERAL FUELS]					
Coal, bituminous	210,000	220,000	220,000	200,000	200,000
Petroleum, refinery products thousand 42-gallon barrels	5,000	4,400	4,500	4,500	4,500
[INDUSTRIAL MINERALS]					
Limestone:					
For cement and lime thousand metric tons	1,200	1,200	1,300	2,000	2,600
Crushed aggregate thousand metric tons	700	700	700	750	800
Lime, calcined thousand metric tons	160	165	135	130	140
Cement	550,000	540,000	560,000	880,000	1,126,728 *
Clays:					
Brick	3,300	3,300	3,000	3,000	3,100
Building, not further specified	33,000	33,000	30,000	30,000	31,000
China and ball	200	200	200	200	200
Sulfur:					
Gross weight:					
Pyrite concentrate	290,000	290,000	290,000	100,000	--
Sulfuric acid ⁴	15,000	15,000	40,000 ^r	600,000 ^r	990,000
Sulfur content:					
Pyrite concentrate (42% S)	122,000	123,000	123,000	42,000	--
Sulfuric acid (32.6% S)	4,890	4,900	17,000 ^r	200,000 ^r	300,000
Total, S content	127,000	128,000	140,000 ^r	240,000 ^r	300,000
Sand and gravel, construction thousand metric tons	300	300	300	320	350
[PRECIOUS METALS & STONES]					
Gold kilograms	956	1,270	1,930	3,100	3,400
Silver kilograms	3,000	3,500	4,000	6,000	6,500
Gemstones:					
Amethyst kilograms	1,500,000	1,300,000	900,000	1,400,000	1,300,000
Beryl kilograms	5,000	5,000	4,000	6,000	5,500
Emerald kilograms	2,100	2,100	1,600	37,850 ^{*r}	21,086 *
Tourmaline kilograms	27,000	25,000	15,000	21,000	20,000

* Reported figure.

^r Revised. do. Ditto. -- Zero.

¹ Estimated data are rounded to no more than three significant digits; may not add to totals shown.

² Table includes data available through January 9, 2012.

³ Terms used are as defined by the International Copper Study Group.

⁴ From the Chambishi and the Nkana acid recovery plants.

Source: 2010 Minerals Yearbook, U.S. Geological Survey, US Department of Interior

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Zambia Development Agency has recently established as a One-Stop Shop aimed at supporting Investors in obtaining information and processing all regulatory requirements in one place thereby making it easier and quicker to set up or expand their businesses in the country.



