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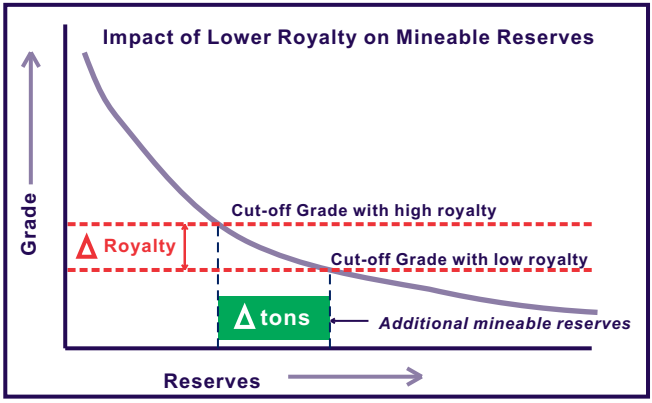

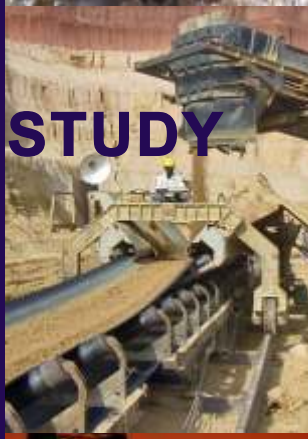

MINING SECTOR POLICY STUDY

Paul Jourdan, Gibson Chigumira, Isaac Kwesu & Erinah Chipumho

December 2012

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EXECUTIVE SUMMARY

Zimbabwe has a rich and diverse minerals resource base that could be (and should be) an important contributor to sustainable growth and development. The sector has rebounded dramatically from the hyperinflation economic crisis (2006-8) and with "dollarisation" (2009) the value of mineral production has increased six-fold to about $3 billion in 2011. However, if this increased mining activity is to ultimately result in more than just "holes-in-the-ground", the crucial mineral linkages need to be realised whilst the resources are still extant.

In order to optimise the economic linkages the current "colonial" minerals governance regime ("free mining") needs to be fundamentally overhauled to both encourage the discovery of new mineral deposits and to maximise the developmental impact of known mineral assets through public tender against developmental outcomes. In this regard a Mineral Cadastre Information Management System (MCIMS) needs to be established as soon as possible.

The current historically high mineral prices (provoked by strong Asian demand) are likely to continue for the next couple of decades, so long as the major Asian economies (China and India) continue to display robust growth. Zimbabwe needs to take advantage of this window of opportunity to use its finite mineral resources endowment to catalyse wider national economic growth and development through the maximisation of the seminal economic linkages. These are:

Fiscal linkages- mineral resource rents must be captured, through the introduction of a resource rent tax, and reinvested into building long-term physical and human (knowledge) infrastructure, to underpin future national competitiveness, and into minerals development (exploration and technology development) to prolong the life of the minerals sector.

Backward linkages – the minerals inputs sectors (capital goods, consumables, services) need to be grown, to take advantage of the expanding local demand, through measures to optimise the local content of mining purchases. The realisation of the backward linkages opportunities could seed wider industrialisation (capital goods).

Forward linkages – minerals could provide critical feedstocks into other job-creating sectors provided that they are beneficiated into appropriate intermediate products such as iron/steel, polymers and base metals for manufacturing; nitrogenous and phosphatic fertilisers for agriculture; cement, steel and copper for infrastructure and fossil fuels for power. However, mineral beneficiation often requires state facilitation through incentives and disincentives, such as a small export tax if the next value addition step is clearly viable. The use of PGM producer power, together with South Africa, should be explored to stimulate local value addition.

Knowledge linkages – the maximisation of human resource development (HRD) and R&D opportunities is essential for realising full benefit from the backward and forward linkages. No resource-based State has industrialised without significant investment in human and technology development. Joint strategies with the private sector should be pursued (through PPPs), including the reinvestment of resource rents into knowledge development.

Spatial linkages – high rent minerals are often able to finance major infrastructure (transport, power and water) which could underpin the development of other sectors such as agriculture, forestry and manufacturing, provided that the mineral leases provide for excess capacity and third party access at non-discriminatory prices. The huge Mwanesi iron ore resource could possibly underpin a low-cost logistics corridor to the coast which could substantially reduce national costs of trade (imports/exports).

All of the linkages would be greatly enhanced through access to larger markets and in this regard configurations for equitable regional integration should be investigated and pursued (e.g. SADC and SACU).

Through these channels, Zimbabwe's minerals endowment could catalyse wider economic development, but only if the minerals regime is overhauled and effectively administered to maximise all of the developmental opportunities associated with their extraction.

By far the major two problems facing the mining industry have been insufficient and erratic power supply, and the lack of policy certainty (as evidenced by the sudden imposition of new royalties and fees, and opaque indigenisation targets). The next most pressing problem is the acute national shortage of capital and high interest rates.

These basic problems affect virtually all sectors of the economy. For the mining sector in particular, the analysis in this study develops more than 50 recommendations for strengthening mining sector policies, institutions and procedures. The recommendations are summarised in the section 4 of the report (Conclusions and Recommendations). Key points include:

Minerals Governance: The current "free-mining" (FIFA) colonial mineral regime is inappropriate for using mineral assets to underpin wider development and industrialisation and consequently consideration should be given to the following proposals on the administration of national mineral assets:

- Streamline (simplify) the Mines and Minerals Act (MMA) to cater for exploration licenses and ASM (Artisanal and Small-scale Mining) prospecting licences, ASM leases, and Mining Leases on a use-it-lose-it principle. Shift the detailed procedures and modalities to attendant MMA Regulations;
- Amend the MMA to cater for a hybrid of FIFA (claims) and a public tender system (for "unknown" and "known"

mineral resource terrains, respectively) and to cover backward and forward linkages milestones (e.g. % value added at 5, 10, 15, 20 years) and a corporate minimum for spending on knowledge formation (human resource development [HRD] and R&D) of at least 5% of payroll;

- Urgently locate funds to establish a functional national mineral cadastre (MCIMS);
- Rebuild the ASM support "golden triangle": finance, marketing and technical support; and
- Urgently resolve the national power crisis through fast-tracking the current rehabilitation and expansion projects as well as through imports. Power from Mozambique needs to be assessed, both from Cabora Bassa (and, in future, the Mpande Nkuwa hydro-electric power station) as well as from the planned thermal plants based on waste coal from the Tete coalfields (Vale and Rio Tinto).

Fiscal Linkages: The current mineral fiscal regime neither effectively captures resource rents nor optimises the developmental impact of mineral extraction. Consideration should be given to the following proposals to maximise the capture of resource rents without sterilising resources and whilst still remaining attractive for FDI:

- Corporate Income Tax (CIT): Currently at 25% except 15% for Special Mining Licenses (SMLs); standardise at 25% for all mining;
- Royalties: Currently 1% - 15% (by mineral). Lower to 1-2% for all minerals, taking into account that royalties sterilise resources and encourage sub-optimal extraction (high-grading);
- Resource Rents Tax (RRT): Currently 0% except for an Additional Profits Tax on Special Mining Leases (SMLs) at 42.5%. Introduce 50% RRT above a threshold return on investment (ROI);
- Reduce the Withholding Tax on expatriated dividends to 15%, but increase to 30% for investors domiciled in tax havens;
- Abolish the practice of permitting the retention of mineral rights against the payment of Retention Fees (use-it-or-lose-it principle); and
- Clarify the Indigenisation Policy by making the targets 25% by year 10 and 51% by year 25 (i.e. any Mining Lease renewal (at 25 years) must be conditional on 51% beneficial ownership by indigenous Zimbabweans).

Backward Linkages: Building the seminal minerals backward (upstream) linkages is crucial to using the national mineral resource endowment to underpin wider industrialisation. In this regard the following proposed interventions should be assessed:

- Amend the MMA to include upstream value addition (backward linkages: local content[2]) as a clear objective of the Act and strengthen the Minister's power to include such conditions in the mining concession/lease;
- Make local content commitments a bid variable with significant weighting for all new competitively tendered mineral concessions (auctions);
- Consideration could be given to expanding the Indigenisation Law to cover purchases from indigenous suppliers, based on indigenous proportion of local value added in the goods or services supplied;
- Task the Ministries of Industry and Commerce, Economic Planning and Investment Promotion, Mines and Mining Development and Science and Technology with developing and implementing comprehensive industrial sub-sectorial strategies to grow the mineral upstream sectors (capital goods, services, consumables); and
- Establish a Minerals Sector Knowledge Fund in partnership with the mining industry, through an obligatory spending floor of $\geqslant$5% of payroll on local HRD and R&D, to rebuild the backward linkages skills and technology development capacity.

Forward (downstream) Linkages: Minerals and mineral products constitute critical feed stocks into a wide range of downstream sectors such as manufacturing, agriculture and infrastructure. In this regard the following proposals warrant further consideration:

- Introduce beneficiation milestones in mining leases at 5, 10, 15 and 20 years and make downstream value addition a bid variable for all new competitively tendered mineral concessions;
- Impose a small export tariff (<5%) on select raw mineral exports to encourage beneficiation, where independently shown to be viable;
- The viability of a refinery for Platinum Group Metals (PGMs) should be independently assessed and, if positive, an export tax on unrefined PGMs should be considered;
- The viability of a stainless steel slab plant should be independently assessed and, if positive, an export tax on ferrochrome and nickel exports should be considered; and

[2]Zimbabwean value added as a percentage of total purchases of goods and services.

Use "Producer Power" for PGMs: Amend the Gold Trade Act to also require PGM Authorised Dealers and engage the government of South Africa on the feasibility of collaborating on the marketing of PGMs and growing downstream industries.

Knowledge Linkages: Establishing the minerals knowledge linkages (skills and technology development) is critical to developing the backward/forward linkages. In this regard the following proposals should be considered:

- Undertake a survey to identify the critical minerals technical skills needs and develop a national minerals (and linkage industries) HRD strategy;
- Re-attract skills from the diaspora through interventions that assist in locating skilled Zimbabweans, lure them to relocate back home and on remuneration for critical scarce skills;
- Introduce a minimum minerals knowledge spending target of 5% of payroll (amend MMA) to fund local skills formation and technology development for the minerals sector and back/forward linkage industries;
- Rebuild mineral technology development institutions (Institute for Mining Research, Government Metallurgical Laboratory, Bulawayo School of Mines);
- Use of a portion of the proposed RRT to fund;
    - The training and remuneration of Maths and Science teachers to upgrade school education;
    - Free engineering and science tertiary education;
    - Financial support to Engineering and Science Faculties, including post-grad programmes at tutiary institutions; and
    - Grants.
- Investigate the establishment of a dedicated Minerals Technology Fund (MTF) as a Public-Private Partnership (PPP) with the mining industry, pedagogical institutions and state enterprises (ZMDC) and institutions.

Spatial Linkages: Mineral endowments can have significant spatial linkages both through the development of local communities and the collateral use of mineral infrastructure (transport, power, water) by other sectors. In this regard the following interventions should be considered:

- Stipulate third party access at non-discriminatory prices to all mineral infrastructure, as well as obligatory reasonable over-capacity, to cater for other users;
- Make investment in excess infrastructure capacity a bidding criteria for all public tenders of mineral assets;
- Oblige all Mining Lease holders to establish Corporate Social Investment (CSI) programmes in the surrounding communities and to report on them annually;
- Establish a Mwanesi Spatial Development Initiative (SDI) based on the huge Mwanesi iron ore resource, through the public tender of the resource that selects the investment partner that maximises the spatial (infrastructure) impacts as well as the other linkages. This should be done together with the government of Mozambique to give the Zimbabwean economy a low-cost logistics corridor to the coast and the global economy; and
- Investigate options for a second SDI based on a national coal export corridor.

In conclusion, Zimbabwe's mineral endowment could not only underpin the rebuilding of the economy, but also catalyse wider industrialisation, growth and development. However, this will not necessarily happen under the current "free-mining" mineral regime with limited mining lease conditions. The mineral regime needs to be substantially overhauled to facilitate the maximisation of the developmental impact of finite resources on this and future generations, through ensuring that all the attendant economic linkage opportunities are realised. In the short term the most important constraint facing the industry is the national power shortage which needs to be urgently resolved.

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ABBREVIATIONS

AfDB	African Development Bank
ALSF	African Legal Support Facility
AMSA	Arcelor-Mittal South Africa
AMV	Africa Mining Vision
AMWUZ	Associated Mine Workers Union of Zimbabwe
ANC	African National Congress (SA)
APT	Additional Profit Tax
ASM	Artisanal & Small-scale Mining
AU	African Union (AUC: African Union Commission)
BAFO	Best and Final Offer
BEE	Black Economic Empowerment (SA)
BIF	Banded Ironstone Formation
BIMCO	Buchwa Iron Mining Company Ltd. (Bimco)
BMR	Base Metals Refinery
BSAC	British South Africa Company
BSM	Bulawayo School of Mines
Capex	Capital Expenditure
CBM	Coal Bed Methane
CCGT	Combined Cycle Gas Turbine
CGT	Capital Gains Tax
CIT	Corporate Income Tax
CMA	Common Monetary Area (Rand Zone)
COMZ	Chamber of Mines of Zimbabwe
CRC	Cold Rolled Coil (steel)
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
CSR/I	Corporate Social Responsibility/Investment
DC	Development Corridor
DFI	Development Finance Institution
DMC	District Mining Commissioner
DRC	Democratic Republic of the Congo
DRI	Direct Reduced Iron
EBIT	Earnings Before Interest and Taxes
EITI	Extractive Industries Transparency Initiative
EOI	Expression of Interest
EPCM	Engineering, Procurement, Construction Management
EPO	Exclusive Prospecting Order
EPP	Export Parity Price
ETFs	Exchange Traded Funds
FDI	Foreign Direct Investment
FIFA	First in First Assessed
FOB	Freight On Board (for trade valuations)
Forex	Foreign Exchange
GDP	Gross Domestic Product
GML	Government Metallurgical Laboratory
GPS	Global Positioning System
GRP	Government Roasting Plant
GST	General Sales Tax
Hcs	Hydrocarbons (oil & gas)
HCB	Hidroelectrica Cabora Bassa
HEP	Hydro-electric Power
HIPC	Highly-Indebted Poor Countries
HPS	Hwange Power Station
HRD	Human Resource Development
IMR	Institute of Mining Research
IPP	Import Parity Price
IPP	Independent Power Producer (context)
ISLP	International Senior Lawyers Project
JPT	Joint Project Team
JV	Joint Venture
MAB	Mining Affairs Board

MCIMS	Mineral Cadastre Information Management System
MDA	Mineral Development Agreement
MIGA	Multilateral Investment Guarantee Agency
MMA	Mines and Minerals Act
MMCZ	Minerals Marketing Corporation of Zimbabwe
MOODCAAA	Moody's AAA Corporate Bond Index Rate
MSF	Minerals Skills Fund
MTF	Minerals Technology Fund
NRZ	National Railways of Zimbabwe
OECD	Organisation for Economic Cooperation and Development
Opex	Operating Expenditure
PGM	Platinum Group Metals (Pt-platinum, Pd-palladium, Rh-rhodium, Ru-ruthenium, Ir-iridium, Os-osmium)
PM	Precious Metals Refinery
PPP	Private-Public-Partnership
R&D	Research and Development
RFP	Request for Proposals
RMG	Raw Materials Group
ROI	Return on Investment
ROM	Run-of-mine
RRT	Resource Rent Tax
SA	South Africa
SACMEQ	Southern and East African Consortium for Monitoring Education Quality
SACU	Southern African Customs Union
SADC	Southern African Development Community
SAP	Structural Adjustment Programme
SAPP	Southern African Power Pool
SDI	Spatial Development Initiative (Development Corridor)
SMC	Selous Metallurgical Complex
SML	Special Mining Lease
SW	South West
SOW	Scope of Work
SWF	Sovereign Wealth Fund
TAI	Technology Achievement Index
TNC	Transnational Corporation
UDI	Unilateral Declaration of Independence
UNCITRAL	United Nations Commission on International Trade Law
UNECA	United Nations Economic Commission on Africa
USGS	United States Geological Survey
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
VA	Value Added
ZCTU	Zimbabwe Congress of Trade Unions
ZGS	Zimbabwe Geological Survey
ZIMRA	Zimbabwe Revenue Authority
ZISCO	Zimbabwe Iron and Steel Company Ltd.
ZMDC	Zimbabwe Mining Development Corporation

Units	
G	Giga = billions
M	Mega = millions
k	kilo = thousands
USD	US Dollars
$	US Dollars
Usc	US cents
T	metric tonnes
Tpa	tons per annum
Ct	carat/s
Oz	Troy ounce/s
W	watts
Ga	billion years
TCF	Trillion cubic feet
Km	Kilometers
Ha	Hectares
Y or y	year/s

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The views and findings of this study do not necessarily reflect the views of USAID-SERA. The contents of this paper as well as any errors or omission remain the sole responsibility of the authors.

1. INTRODUCTION

The objective of the study is to "review the state of mining activities in Zimbabwe to date and provide policy recommendations"[3] for increasing the contribution of the mining sector to broad-based economic growth and enhancing the development impact of mineral extraction.

Following this short Introduction, Section 2 looks at Zimbabwe's mineral endowment, geology and mining history, before reviewing conditions in the Minerals Sector, by type of mineral. The section also examines future prospects for growth in the mineral sector, minerals marketing institutions, labour conditions, and the current legislative framework.

Section 3: looks in detail at mineral policies and institutions in terms of maximising the developmental impact of mining, starting with the need for an appropriate minerals administration regime, including artisanal and small-scale mining and the establishment of a mineral cadastre information management system (MCIMS). The section then assesses the current global crises and underlying commodities boom with a view to determining likely future demand for minerals.

This is followed by a discussion of a sustainable resource-based development strategy for Zimbabwe that maximises the seminal mineral sector linkages. The main part of the report examines in detail each of the mineral linkages - fiscal, backward (upstream), forward (downstream), knowledge and spatial – and identifies recommendations on how each linkage might be optimised in order to convert the country's comparative advantage in resource wealth into a broader competitive advantage for national development. The section on spatial linkages includes a case study on the potential for establishment of all the linkages through a spatial development initiative based on exploitation of the huge Mwanesi Range iron ore resource.

The study closes in Section 4 with concluding remarks, a summary of more than 50 recommendations derived from the technical analysis, and 15 proposals for future research on mining sector issues.

Supplementing the main report are nine appendices covering, respectively: the terms of reference for the study; a short history of mining in Zimbabwe; extracts on mining from the Government of National Unity's initial economic recovery plan (STERP); an overview of the current role of the mining sector in the economy; a model framework for the Resource Rent Tax (RRT); a tabulation of changes in the structure of the industry since 1994; the structure of the gold mining sector; and a schedule of meetings conducted in carrying out this study.

[3]See. Appendix 1: Task Terms of reference

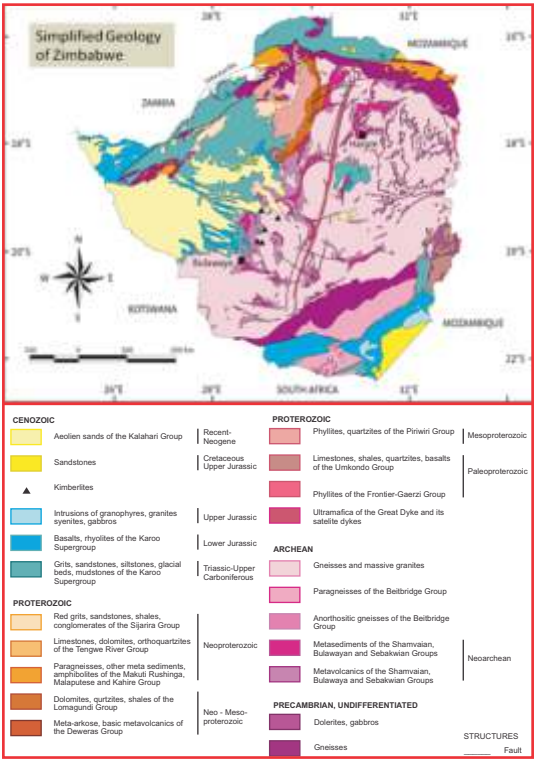
2. ZIMBABWE'S MINERAL ENDOWMENT

2.1 GEOLOGY

Zimbabwe predominantly consists of Achaean (Precambrian >600Ga) rocks, including:

- the Achaean granite/greenstones,
- the Achaean Limpopo mobile belt,
- the Paleoproterozoic Magondi Supergroup (Umkondo and Lomagundi Groups),
- the Neoproterozoic Makuti, Rushinga and Sijarira Groups.

Figure 2: Geological Map of Zimbabwe



Source: Thomas Schlüter, 2008[4]

The structural geology of Zimbabwe is dominated by the Zimbabwean Craton, cut by the Great Dyke and surrounded by rift valleys in the north and north-west (Zambezi Rift) and mobile belts in the north (Zambezi Belt), east (Mozambique Belt) and south (Limpopo Belt). In fact the only geological border that does not coincide with a political border is in the south-west where the border with Botswana runs across the Zimbabwean Craton. The craton is overlain in the north, north-west and east by Proterozoic and Phanerozoic sedimentary basins. This uncanny coincidence of political and geological divisions has sometimes been attributed to foreknowledge of the geology on the part of Cecil John Rhodes during the final delimitation of the region's frontiers in the 1880's and early 1890's, but it is more likely that the British South African Company (BSAC) had a vague idea of the distribution of the fabled Munhumutapa gold fields, from explorers such as Karl Mauch, and that the settlers, who in many ways determined the land which they wanted to expropriate, preferred the malaria free, more temperate highlands of the Craton.

[4]Thomas Schlüter 2008, "Geological Atlas of Africa", Springer-Verlag, Berlin

The Craton was formed during the early Archaean (3.6 to 2.5 billion years ago) and consists of granites and gneisses which contain few economic minerals except for vein (pegmatite) deposits near contacts, but the Craton also contains the economically important schistbelts also known as the greenstone or gold belts which comprise a volcano-sedimentary sequence containing most of the mineral deposits currently exploited. These include, in order of current value of output, the vast majority of gold deposits, the nickel-copper-cobalt deposits (Trojan, Shangani and Epoch), the podiform chromite deposits (Shurugwi, Valley and Inyala), the iron ore deposits (Buchwa, Ripple Creek and Mwanezi), numerous limestone deposits (Sternblick, Cleveland, Zisco and Early Worm), the asbestos deposits (Shabanie, Gaths and King), the lithium pegmatite of Bikita, the Sandawana emeralds, pyrites (Iron Duke), the Barton Farm magnesite and numerous minor deposits of lead, zinc, antimony, tungsten, tin, barytes and corundum.

The Limpopo Mobile Belt runs SSW-NNE in the south of the country, divides the Zimbabwean and Kaapvaal Cratons and consists of metamorphosed cratonic rocks containing gold deposits (Renco), corundum and magnesite occurrences. It has a complex polyphase history spanning the early Archaean (greater than 3.2 Ga) to the mid-Proterozoic.

The Proterozoic is represented by two major sedimentary basins, in the north-west (Deweras, Lomagundi and Piriwiri Groups) and on the eastern margins of the craton (Umkondo Group). The former consists of metasediments and volcanics and are economically important for their copper deposits (Miriam, Norah, Shackleton and Angwa) and also contain important resources of copper-lead-zinc (Copper Queen and King), dolomite (Springbok), gold, tin (the Kamativi pegmatite), graphite (Lynx), kyanite, tantalum (tantalite pegmatites) and gemstones. The Umkondo Group on the eastern border is relatively unimportant economically, but has limestone and copper occurrences.

By far the most spectacular igneous body is the Great Dyke, also of Proterozoic age (2.5 Ga), stretching over 500 km NNE to SSW in the centre of the country. This layered intrusive contains enormous reserves of stratiform chromite all along its length (Lalapanzi, Mutoroshanga, Great Dyke and Vanad) and also contains large reserves of platinum, palladium, nickel, copper and gold in the four norite complexes of Musengezi, Hartley, Shurugwi and Wedza.

The other Proterozoic igneous event was the intrusion of the numerous Mashonaland dolerite sills and dykes about 1.9 Ga ago right across the craton, but with a concentration of sills in the northeast. These contain resources of nickel and copper (Madziwa) and are currently exploited for ornamental stone, the so-called "black granite" of Mutoko. The Proterozoic Mobile Belts flanking the Craton on its northern and eastern sides consist of metamorphic rocks in the Mozambique Belt (east) and the Zambezi Belt (north) with mineral occurrences of kyanite (Ky Mine) pegmatites with tungsten, tantalum, mica, beryllium and gemstones.

The Karoo System sediments and volcanics of the Phanerozoic were laid down in three main basins, the middle and lower Zambezi basins in the west and north and the Save-Limpopo basin in the south and south-east, and contain all of Zimbabwe's large coal resources, mainly in the sandstones and shales of the Ecca Series, and also has resources of fireclay, limestone, diaspore, and a significant uranium and vanadium sandstone deposit has recently been delineated at Kanyemba in the Zambezi Valley. After the Karoo volcanics the post-Karoo Libombo, Limpopo and Botswana dolerite dyke swarms were emplaced, but contain no mineral occurrences.

The Mesozoic intrusive alkali carbonate ring complexes of Dorowa, Shawa and Chishanya, in the centre-east of the country, are important for their resources of phosphate rock (apatite) and vermiculite. The intrusive kimberlite pipes north of Bulawayo and near Beitbridge are pre-Karoo while those near the start of Lake Kariba are post-Triassic (Sebungwe), but none of these are particularly rich in diamonds. However, the diamondiferous kimberlite pipes in the South West (SW) of the country (River Ranch and the Murowa pipes) are mined for diamonds.

The Mutandawhe granitic intrusion in the south-east is thought to be late Jurassic and contains a significant low grade molybdenum resource and tungsten deposits. During the late Jurassic to early Cretaceous, sandy sediments were deposited in various places and are of no economic importance, nor indeed are the Tertiary Kalahari aeolian sands covering the south-east of Zimbabwe, but a minor Tertiary-Quaternary diatomaceous earth deposit has been identified in the Zambezi Valley near Chirundu in the north-east. Both gold and diamonds occur in recent alluvial deposits.

2.2 MINERAL RESOURCES

Zimbabwe's mineral resources are mainly found in the following geological formations and bodies:

- **The Greenstone Belts**: Gold and silver, as well as considerable resources of iron ore, nickel, copper, cobalt and podiform chromite, also chrysotile asbestos (Mashaba Igneous Complex), limestone, pyrite and antimony;
- **The Great Dyke**: PGMs[5] & Au with associated copper, nickel and cobalt. Also, chromium (chromite seams), as well as minor asbestos and magnesite;
- **The Magondi Supergroup**: Copper & silver (Dewera Group);

[5]PGMs: Platinum Group Metals (Pt-platinum, Pd-palladium, Rh-rhodium, Ru-ruthenium, Ir-iridium, Os-osmium)

- **The Karoo Basins**: Considerable bituminous coal, coking coal, anthracite and coal-bed methane (CBM) resources;
- **The Carbonatite Igneous Complexes**:, phosphate (Dorowa, Showa);
- **Kimberlite pipes**: diamonds (Morowa, River Ranch);
- **Pegmatites**: Lithium minerals, columbite-tantalite, cassiterite, et al;
- **Recent alluvial and placer deposits**: Gold and diamonds (possibly from reworked Umkondo conglomerates).

Table 1: Zimbabwe's Estimated Mineral Resources

Mineral	Estimated Resource (Tons)	Current Annual Extraction Rate (Tons)
Gold	13 million	20
Platinum	2.8 billion	2.4 million
Chromite	930 million	700 000
Nickel	4.5 million	9 000
Coal	26billion	4.8 million
Diamonds	16.5 million carats (ct)	Infancy
Iron Ore	30 billion	300 000
Copper	5.2 million	None
Coal Bed Methane (CBM)	Largest known reserve in southern Africa	None

Source: Reserve Bank of Zimbabwe, Monetary Policy statement (February 2009)

Almost all the known iron ore resources are in the massive low grade (40% Fe) Mwanesi Range resource. Worst (1962) estimates resources, above the surrounding elevation (400 feet), at 33Gt. This would imply that there could be similar resources amenable to opencast mining below the surrounding datum, giving a total possible resource in the order of 70 billion tonnes. The diamond resource estimation in (16.5M carats [ct]) appears to be a massive under estimation, given that 18M ct were produced in 2010/11. In 2012 David Matyanga put the national coal resource at 30Gt.[6]

Unlike the Witwatersrand stratiform gold reefs in South Africa, where future reserves can be determined with some precision, the Zimbabwean greenstone belt gold resources are notoriously difficult to extrapolate with accuracy, without extensive drilling and assaying. Consequently the actual gold resources could be much higher than reported.

2.3 RECENT MINING HISTORY

"The most important single element determining the nature of economic and political development in Southern Rhodesia was the BSAC's overestimation at the end of the nineteenth century of its mineral resources, and the persistence of this overestimation for roughly fifteen years."[7]

The enormous costs that were incurred by the BSAC in bringing the railway to Bulawayo and in colonising the country were not repaid by the expected mineral profits. This led the company to encourage the formation of a white rural bourgeoisie to develop the agricultural potential and thereby raise the value of the company's assets, particularly the lands.

In the early days, the BSAC demanded a 50% free equity in any mining company set up to exploit the minerals. Rhodes' settler column travelled up to the Shona-speaking area in the north-east in 1890, carefully avoiding the Ndebele controlled part of the country in the south-west. After disappointing mineral discoveries in the Shona area, the colonialists invaded the Ndebele area in 1893 in the hope of discovering gold deposits there, but the much vaunted mineral riches of Zimbabwe continued to elude them.

In 1896 the settlers were nearly wiped out when the Shona and Ndebele rose up together in rebellion at being dispossessed of their land. The first "chimurenga" (liberation war) was finally put down in 1897.

When the BSAC charter expired in 1923 there was a settler referendum to decide on whether or not to incorporate with the Union of South Africa which had been formed in 1910. The result was a clear rejection and in that year the country was renamed Southern Rhodesia and it became a British Crown Colony with "Responsible Government" (settler voters only).

[6] www.fossilfuel.co.za/David%20Matyanga.pdf
[7] Arrighi 1973, p336

From then on the country was effectively ruled by the settlers and in 1953, in an attempt to create an economic block to counter the Union of South Africa, the settler supported Central African Federation (CAF) of the two Rhodesias and Nyasaland was created. This gave the Southern Rhodesian settlers access to the enormous copper mining revenues from Northern Rhodesia, plentiful labour from Nyasaland and the markets of both.

The nationalist movements in Northern Rhodesia and Nyasaland were clearly opposed to the Federation which they rightly saw as being settler dominated (the federal legislature had twenty-nine settler seats and six black seats) and were able to bring about its dissolution in 1963. Soon after they both achieved independence as Zambia and Malawi.

The main nationalist movements, ZANU and ZAPU, were banned in the early sixties and in 1965 the settler regime declared unilateral independence (UDI) from Britain and changed the name of the country to Rhodesia. The United Nations responded with economic sanctions against Rhodesia which were not particularly effective as they were never applied by its southern ally, apartheid South Africa.

The nationalists in exile launched a guerrilla war in 1966 which escalated rapidly with the defeat of the Portuguese in neighbouring Mozambique in 1974. By 1979 most of the country was under martial law and late that year the settlers capitulated at the Lancaster House Conference to majority rule. Independence was gained in 1980, ZANU won the election and in 1987 the two liberation parties ZANU and ZAPU merged to form ZANU-PF.

As effective economic independence was gained from Britain as early as 1923, the country was able to proceed with a more balanced economic development in the thirties and forties than other African colonies, ruled from Britain. During this period a substantial metallurgical and engineering capacity was installed which was further strengthened during Federation. It was this basic capacity that, with UDI and sanctions, enabled a wide ranging import substitution development program in the sixties and seventies.

In 1987, Zimbabwe had the fourth highest GNP per capita of all sub-Saharan African countries with populations greater than two million (after South Africa, Cameroon and Ivory Coast) and in 1986 it had the highest manufacturing value-added per capita in the whole of independent Black Africa. Due to the global recession, particularly the fall in primary commodity prices, Zimbabwe's GDP hardly grew in real terms in the 1980's and GDP per capita actually shrunk over this period.

During UDI sanctions period the Rhodesian economy became closely linked to that of its much larger ally, apartheid South Africa, via a series of trade and transport agreements. The main export market for Zimbabwe's expanding manufacturing sector was South Africa. In the 1980s the government attempted to reduce this dependency and from 1981 to 1987, South Africa's proportion of total trade fell substantially, from 24% to 13%. This delinking with South Africa did not lead to an increase in trade with fellow members of the SADC, which stayed constant, but rather a shift to the developed countries.

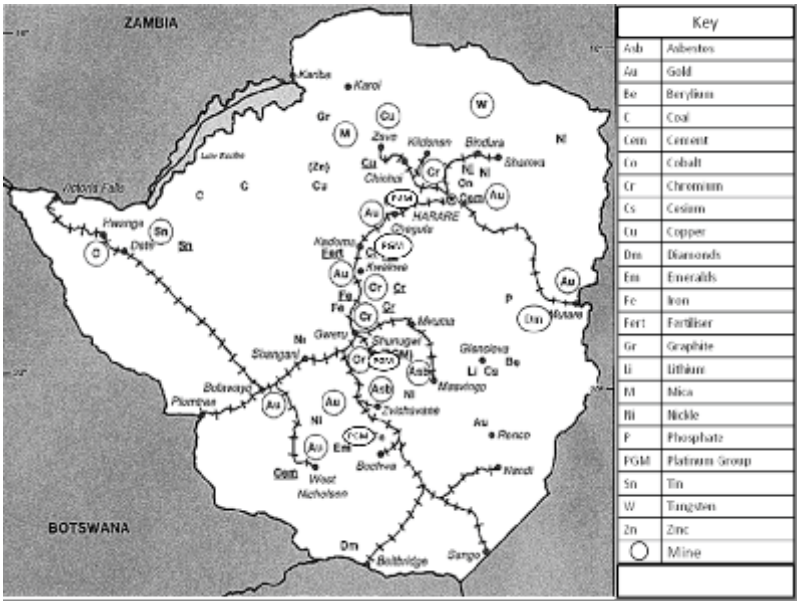
Before Mozambique applied sanctions against Rhodesia in 1976, the bulk of the country's foreign trade went via the ports of Beira and Maputo, but after 1976 almost all trade went via South Africa. After independence Zimbabwe attempted to shift its trade routes away from South Africa back to Beira and Maputo and to this end Zimbabwe maintained a large contingent of troops in Mozambique in the 1980s to guard the Beira and Limpopo corridors from attacks by the South African sponsored MNR (Renamo) as the maintenance of alternative export routes was seen by government as being strategically essential. This threat disappeared with the liberation of South Africa in 1994 and the normalisation of relations between the two countries. By 2000 trade between the two constituted their largest trading volumes in the southern African (SADC) region.

Inflation started taking off in the late 1990s due to increasing government fiscal deficits caused in part by large pay-outs to war veterans and the war in the DRC. The land reclamations from 2000 further reduced revenues and also limited access to foreign loans (financial sanctions) resulting in the acceleration of inflation and the final implosion of the Zimbabwe dollar in 2008 and the adoption of the multi-currency system (dollarization) in February 2009. The contribution of the main sectors to GDP was unchanged from independence to 2000. Manufacturing was the largest of the productive sectors followed by agriculture and mining, though it should be noted that the smelting and refining of certain metals (ferrochrome, iron and steel) is classed as manufacturing rather than mining. However, hyperinflation and the contraction of manufacturing and agriculture have resulted in the mining becoming the lead productive sector since dollarisation.

2.4 MINING SECTOR OVERVIEW

In 1992, Ericsson and Gibbon observed that the "Zimbabwean mining is much diversified in terms of minerals produced, the number of operating mines and dispersal of control over the mine production. More than 40 minerals are mined; the number of operating mines is 800-900; the most important mining company, Anglo American, controls 25 percent of the value of total mining output and state ownership is not dominant. This situation contrasts sharply with the situation in most African countries. Most mining countries in Africa depend on one single or possibly two or three minerals, there are usually only a few large-scale mines and only a handful, usually transnational mining companies dominate the industry or there is a large state ownership.

Figure 3: Mineral Deposits & Mines



Source: adapted from USGS 2012[8]

The main factors, which have led to this situation, are:

- general economic and political developments.
- a favourable geology. The political boundaries of Zimbabwe coincide almost completely with the geological boundaries of the Zimbabwean Craton and are intersected by the Great Dyke. Both are geological phenomena with large reserves of several economically interesting minerals.
- liberal and clearly defined mining legislation, which has been in force long before independence. A licence to explore, the right to peg a claim and to mine a deposit are given to basically anybody with only limited exemptions. This is in contrast to most African countries where exploration and mining is only allowed with special permits."[9]

The period of settler government with the sanctions that were imposed by the UN in the seventies produced a mining industry that developed in an essentially different way to that of other colonies. Zimbabwe was not developed purely in the interests of the colonising country, as a source for raw materials and a market for manufactured goods, but was developed in the interests of a "national" bourgeoisie, albeit a minority settler one. The settlers had effective control of government from 1923 which resulted in a type of development more akin to that of South Africa than, say, Zambia or the then Zaire (Democratic Republic of Congo).

The imposition of sanctions also had a profound effect on the mode of development by way of forcing national self-sufficiency in a large variety of products. These factors resulted in several strategies regarding the mining industry both in terms of upstream and downstream development. The shortage of foreign exchange, sanctions and the land-locked position of the country provoked a downstream development of the mining industry in the sixties and seventies in order to increase value and decrease weight/volume. Most of the major metals currently produced are reduced to their pure form, except for the precious metals (PGMs and gold). Examples are copper cathodes, nickel cathodes, ferrochrome, pure tin, iron and steel.

Processing and refining of minerals was also necessary for import substitution for the metal inputs to industry as a whole (e.g. copper for wire and cables). Also, several minerals are mined purely as inputs for local industry (generally on a

[8] USGS 2012: "The Mineral Industry of Zimbabwe 2012", http://minerals.usgs.gov/minerals/pubs/country/africa.html#zi
[9] Magnus Ericsson and Chris Gibbon 1992 "Mining Investment, Structural Adjustment and State-Mining Capital Relations in Zimbabwe", in "Mining and Structural Adjustment: Studies on Zimbabwe and Tanzania" by C. S. L. Chachage, Magnus Ericsson, Peter Gibbon, Nordiska Afrikainstitutet, http://www.ethz.ch

small scale) such as pyrites (for sulphur), apatite (for phosphates) and clay (for ceramics and refractories), but also on a large scale such as limestone (for cement and lime) and coal (for energy and metallurgy).

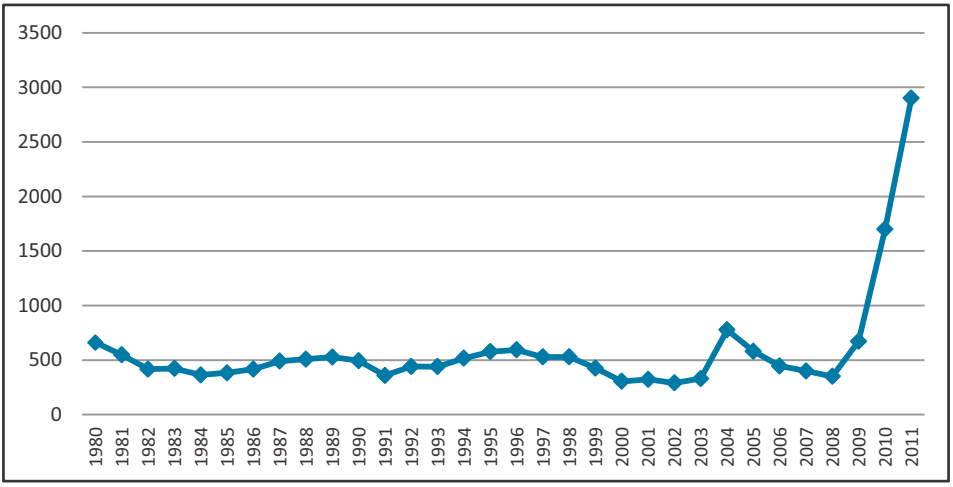
On the upstream side, a wide variety of inputs to the mining industry are manufactured locally. Mining equipment such as ball mills, conveyors, rail and rolling stock, pumps, headgear, ventilation ducting and electrical equipment are (or were) made in the country and a variety of mining chemicals and explosives are also locally manufactured.

Another effect of sanctions was that during UDI the TNC's had difficulty in repatriating their profits which meant that surplus generated by the mining industry was often reinvested in the industry or other parts of the economy. This also had the effect of increasing the overall control of the TNC's over the economy as a whole. The major transnational mining houses had significant holdings in other sectors of the economy. For instance, Anglo American Corporation had interests in manufacturing, farming, services and finance, Lonrho also had holdings in vehicle manufacture, forestry and textiles, while RTZ plc had a local engineering subsidiary manufacturing agricultural equipment (Tinto Industries).

The original capital generally came from abroad but later investment was mainly raised locally, except for RTZ's 1980 investment of GBP 6m in Renco gold mine and the new PGM investments (last 20 years). Until 1995 the mining industry was largely in the hands of the transnational mining companies, the most important being Anglo American Corporation of South Africa (nickel, ferrochrome, phosphates and pyrite), Union Carbide (ferrochrome and gold), RTZ Plc (gold, nickel), Lonrho (gold) and Turner Newall (asbestos). However, since 1995 most of these have divested, except for Anglo's return through its subsidiary, Anglo Platinum in 2003.

Since independence state participation has been on the increase. The state has the largest shareholding in coal mining, the iron and steel industry (Bimco/Zisco), diamonds (Marange) and, in the past, copper and tin. In 1984 the newly formed state enterprise, the Zimbabwe Mining Development Corporation (ZMDC) bought out the ailing local mining interests of Messina of South Africa giving it control over most of the national copper and silver production, but these mines were near the end of their life and finally closed in 2004. ZMDC recently became the partner in the Marange diamond operations with four other joint venture foreign investors. The state also handles all mineral and metal trade through the Minerals and Marketing Corporation of Zimbabwe (MCZ) with the exception of gold, which is marketed through Authorised Dealers (the Reserve Bank of Zimbabwe used to be the sole Authorised Dealer) and PGMs under Special Mining Leases (SPLs).

Figure 4: Value of Mineral Production (US$), 1980-2011



Note: Due to hyper-inflation figures for 2007/8 are estimates
Source: ZIMSTAT and COMZ

Due to depressed real prices for most minerals in the 1980s, there was little expansion in mineral production. In USD terms the total value of mineral production fell by 13% from $603,45m in1980 to $527m in1989, excluding the value of ferrochrome, pig iron, steel, cement, ceramics and coke. It then increased to $529m in 1998 and $776m in 2004 before collapsing during the hyper-inflation induced crisis to below $400m in 2008. Due to robust prices (Asian demand) it has recovered dramatically since dollarisation and is now at an all-time high of about $3 billion (2011).

Table 2: Mineral Production and Value (USDm) 2010/11

Mineral / Metal	2010	Value $	2011	Value $	% Chg Vol	% Chg $
Gold t	9.62	$380	20.8	$711	116%	87%
PGM t	15.56	$510	20.84	$921	34%	81%
Diamonds - Kimberlite k ct	178	$28	367	$64	106%	129%
Diamond – Alluvial M ct	8	$320	9	$450	13%	41%
Chromite kt	517	$115	609	$136	18%	18%
Ferrochrome kt	154	$135	161	$303	5%	124%
Coal Mt	2.4	$100	4.6	$274	92%	174%
TOTAL	-	$1 588	-	$2 859	-	80%

Source: McMahon, 2012 (from Government of Zimbabwe and COMZ)

PGM mining has become the largest sector (by value) followed by gold and diamonds. Both nickel and asbestos production have collapsed though the former is expected to revive over the next few years. Asbestos may also revive if markets and capital can be secured.

Table 3: Production, Exports, Taxes and Employment of Main Mineral Products in 2011

	Production (000)	Gross Revenues ($m)	% of Total Gross Revenues	Exports ($m)	Fiscal Revenues ($m)	% of Total Fiscal Revenues	Employment
Gold oz	418	711	24	711	125	32	8 600
PGM oz	670	921	31	921	64	16	8 115
Diamonds, kimberlite, ct	367	64	2	64	10	2	330
Diamonds, alluvial ct	9 000	450*	15	450*	125	32	8 600
Coal t	4 564	274	9	27	125	32	8 600
Chromite t	609	136	5	136	125	32	8 600
Ferrochrome t	161	403	14	403	125	32	8 600
TOTAL		2 959	100	2 712			

*Due to KPC delays production is often exported in subsequent years; ** includes $36m assumed from ZMDC's profits; *** including chromite mining. Source: McMahon 2012, Table 3.

Source: Gary McMahon 2012 (from Government of Zimbabwe and COMZ)

In 2011 gold and diamonds (assuming transfers to the fiscus by ZMDC) were the largest contributors to fiscal revenues, followed by PGMs. The low PGM contribution, given that it has the largest revenues, is probably due to the fact that two of the three operators are under Special Mining Leases (SPLs) with a different fiscal regime (lower CIT and royalties, but with an Additional Profits Tax – APT) which appears to have resulted in a lower relative tax take.

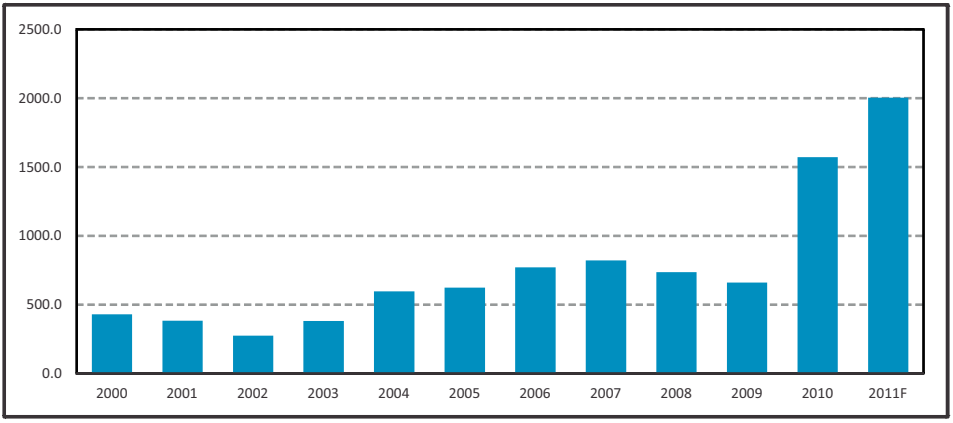
Table 4: Output Volumes: Selected Years

Mineral	1980	1990	2000	2002	2004	2006	2007	2008	2009	2010	2011
Gold t	11.4	16.9	22.1	15.5	21.3	11.4	7.0	3.6	5	9.6	20.8
Asbestos kt	251	161	145	168	104	97	85	12	5	2	-
Nickel	15.1	11.4	6.0	8.0	9.8	8.8	8.6	6.0	4.9	6.1	-
Chromite kt	552	573	669	749	668	700	614	312	194	517	609
FeCr kt	n.a	n.a.	250	258	193	202	190	148	73	154	161
Coal kt	2 589	4 978	3 808	3 721	3 323	2 107	2 080	1 510	1 667	2 670	4 564
PGMs t	-	-	0.90	4.46	8.38	9.29	9.97	10.70	13.18	16.84	20.84
Iron ore Mt	0.80	1.26	0.98	0.27	0.37	0.29	0.33	0.09	0.09	-	-

Source: COMZ

Since 2000 the two growth minerals have been diamonds and PGMs, whilst the production of all other minerals have declined, almost to zero for copper, asbestos, iron ore and nickel, though gold is recovering and nickel is likely to rebound. Iron ore could either return to previous levels (~1.5Mtpa) for the local market (Zisco) or dramatically increase as an export mineral, depending on the current negotiations with Essar. The prognosis for asbestos is unclear due to market constraints.

Figure 5: Mineral Exports (US$m), 2000-2011



Source: McMahon, 2012

Given that virtually all metal and diamond production is exported, mineral exports have by and large tracked production, except for diamonds where, due to the KPC process, a stockpile has been built up, which will be put onto the market over the next few years. In USD terms, mineral exports have increased more than four-fold over the last decade.

Appendix 4 gives a more detailed discussion of the role of the minerals sector in the Zimbabwean economy, including the composition of the mining sector's revenue (costs), its contribution to GDP, to exports, to forex earnings, to fiscal revenues, to employment and to investments, as well as mining CSR or CSI[10] activities. Here, we turn to a review of conditions in the industry by type of mineral.

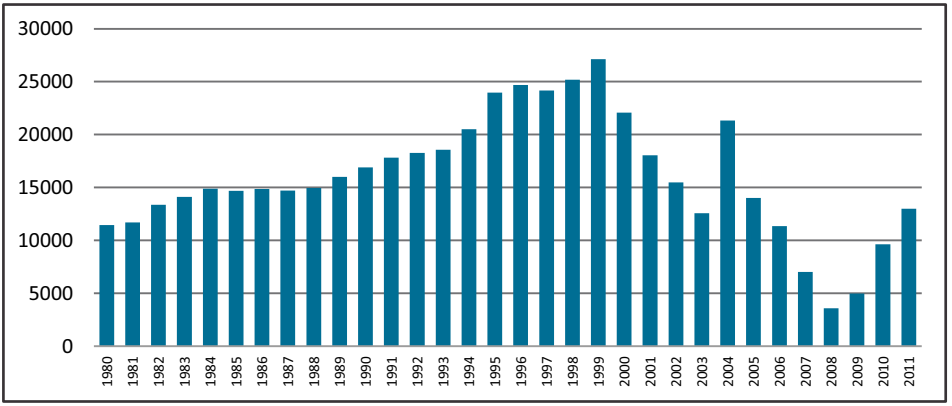
[10]CSR: Corporate Social Responsibility; CSI: Corporate Social Investment

2.4.1 GOLD

In the 1,200 years preceding European colonisation, it is estimated that about 4000 ancient mines produced between 600 and 800 tonnes of gold "...with a normal production during their heyday of about 20,000 oz. a year"[11] and "the gold trade was directly responsible for the rise of the Zimbabwe state".[12]

Gold output peaked in 1916 at 29 tonnes and in the first one hundred years (1890-1989) of modern mining 1.54kt were produced. In 1979, gold replaced asbestos as Zimbabwe's most valuable mineral produced and it competed with ferrochromium as the premier mineral export until 2007 when platinum took over the lead. The 1916 record was nearly surpassed in 1999 when 27 tonnes were produced, but thereafter there was a steady decline due to the economic meltdown to 3.6t in 2008. Since adoption of the multi-currency system in 2009, production has rapidly recovered, to 13t in 2011.

Figure 6: Gold Production (kg), 1980-2011



Source: COMZ, 2012 and RMG, 2012

Gold is still produced by numerous small mines, but the bulk of production comes from a few medium-sized mines. The state used to give comprehensive aid to the numerous small-scale gold mines by providing expertise, assaying, loans, hire of equipment, and by guaranteeing a fixed gold price (by the Reserve Bank of Zimbabwe). In addition, the state roasting plant in Kwekwe used to custom treat refractory ores. In 1988 the state gold refinery was opened in Msasa with a capacity of 90 tpa, well above the foreseeable national needs, to cater for refining from other states in the region. However, it was shut in 2009 when gold miners were authorised to market their own production (under the Gold Trade Act).

One of the few post-Independence investors was Cluff Minerals of the UK which started out with a dump retreatment operation at the Royal Family mine (His Majesty) in the south-east part of the country near Filabuzi. In 1988, Cluff invested a further $5m for the development of the large Freda-Rebecca (Dandadzi) operation near Bindura. By 1989, this was the largest producer in the country, with an output of 1.9 tonnes of gold from about 1mt of ore and Zimbabwe was the main source of revenue for Cluff plc of the UK. It is now owned by Mwana Africa Holdings (Mwana Africa Plc and China International Mining Group) and in 2011 it produced 1.3t of gold (largest producer). This was the first Zimbabwean operation treating large tonnages of low grade ore by heap leach. This type of opencast heap leach operation was the main source of new gold in Western Australia's spectacular ten-fold expansion during the eighties and it would appear that Zimbabwe could have substantial potential for many more of these operations.

Lonrho Plc of the UK used to be the largest gold producer in Zimbabwe from eight mines (4.5 to 5tpa). Five of its mines were owned via its subsidiary in Zimbabwe, Independence Mining (Pvt) Ltd. (Athens, How, Shamva, Tiger Reef and Redwing/Old West mines). It also owned another three gold mines via its holding company Willoughby's of the UK which in turn owned Corsyn Consolidated Mines Limited in Zimbabwe (Arcturus, Mazowe and Muriel mines). Lonrho Zimbabwe (Pvt) Ltd. (Lonzim) was the local holding company and Homestake Mining and Technical Services (Pvt) Ltd. provided financial and technical services to all of the mines. In 1999, Lonrho relisted its mining assets under Lonmin Plc and in 2002 Metallon Gold (Metallon Corporation Plc, owned by Mzi Khumalo of SA) bought five of Lonrho's mines - Red Wing, Shamva, Arcturus, How Mine and Mazowe - for $15,5 million. It also purchased the Motopa prospect from

[11] Summers, 1969, p218
[12] Huffman 1974, p241

Oleaster Investments in 2003. The mines were all closed in 2008 during the hyper-inflation and fixed gold price (below market) crisis but have been reopened since dollarisation and the scrapping of the fixed gold price. Metallon reports resources of 8.7M oz grading 2.9g/t from all of its properties and a capacity to produce about 4tpa of gold.[13]

Other larger gold producers include Blanket Mine (~1.1tpa, Caledonia), Renco Mine (~0.6tpa, Riozim) and Turk Mine (~0.5tpa, New Dawn). In addition about 1.5tpa of by-product gold is produced by the PGM miners. The state mining holding company, the Zimbabwe Mining Development Corporation (ZMDC), owns the Jena, Sabi, and Elvington mines and the dormant Bar-20 mine.

A comprehensive list of gold mines, their status, controlling company, production trends since 1975, and earnings is given in Appendix 8.

All gold bullion used to be bought by the Reserve Bank of Zimbabwe and refined by the state refinery, Fidelity Printers and Refiners, built with assistance from the Perth Refinery in Australia, but the plant has been on care and maintenance since the hyper-inflation crisis. The outstanding Reserve Bank of Zimbabwe debt to the gold miners is apparently the main obstacle to its reactivation. During the meltdown years (high and hyperinflation) gold miners were forced to sell to the Reserve Bank of Zimbabwe at the "official" exchange rate, which was well below the purchasing power rate, causing many mines to close and a collapse in national output.

The principal constraints to gold mining expansion taking advantage of the current high prices are access to capital (many are small operations), reliable power supply, economies-of-scale (consolidation of smaller producers) and availability of skills. In addition, instruments for supporting Artisanal and Small-scale Mining (ASM) need to be rebuilt in the critical areas of finance, technical assistance and marketing. A recent minerals scenarios study estimated that by 2018 production could reach 28.5t, under the current investment regime, or an astounding 82.4t "with more investment stability".[14] The lower scenario would require investments of $450 million and the higher $2.5 billion! Employment in 2018 is projected at 15,200 for the former and 27,600 for the latter. However, there would appear to be major resource constraints to achieve the higher scenario in six years, given that major exploration and reserves delineation would have to be undertaken which would push out the time horizon, if in fact the requisite resources exist.

2.4.2 PLATINUM GROUP METALS (PGM)[15]

The Great Dyke of Zimbabwe contains the second largest known deposits of platinum in the world. The Great Dyke resources are estimated at 1.68 Gt (billion tonnes) grading 5.54 g/ton (grams per ton) PGM's (86%) and Au (14%) with 0.2% Ni and 0.15% Cu. There are currently three operating mines operating namely, Zimplats (Implats), Mimosa (Aquarius & Implats) and Unki Platinum (Anglo Platinum). Current platinum production is at 188 000 ounces per year. Five other platinum projects are at different stages of resource identification (e.g. ZMDC: Bokai and Ngezi-Mhondoro). Besides gold, the platinum industry appears to have the greatest immediate prospect for rapid expansion.

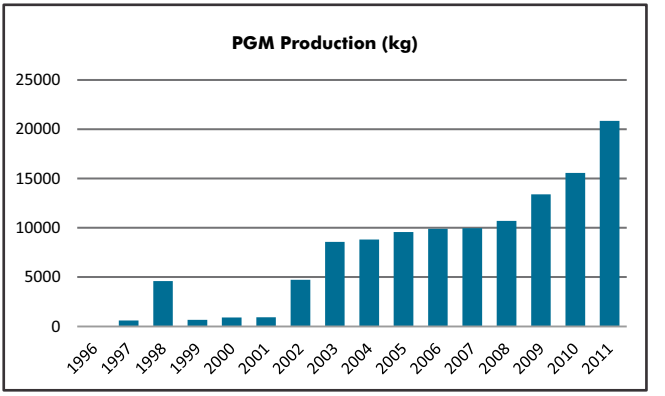
Figure 7: The Great Dyke

Source: Implats

[13]Metallon Corp. 2012 (www.rair-dev.co.za/metallon/default.php)
[14]McMahon 2012, p5
[15]Platinum Group Metals include Pt=platinum, Pd=palladium, Rh=rhodium, Ru=ruthenium, Ir=iridium, and Os=osmium. This section also refers to Au=gold.

The development of Platinum Group Metal (PGMs) mining dates back to 1969 when Union Carbide undertook trial mining at Wedza, which was not viable at the prevailing PGM and Ni/Cu prices. In the 80s RTZim ran the pilot Zinca mine on the Hartley Complex which also proved to be non-viable. In 1994 the Mimosa Mine started producing on a small scale and this was followed by the $500 million BHP/Utah - Delta Gold joint venture investment for the development of the Hartley Platinum mine which closed in 1999 and was taken over by Implats (Delta), who concentrated on the Ngezi opencast resource, and in 2002/3 it was bought by Impala Platinum of South Africa (SA). The BHP-Delta base metals refinery[16] (BMR) was put on care and maintenance in 1999, though current production volumes would appear to be sufficient for its reactivation.

Figure 8: PGM Production (kg), 1996-2011



Source COMZ: www.chamberofminesofzimbabwe.com

The sector has huge potential especially for further expansion and greater value addition (all production is exported as concentrate or matte/leach alloy for refining in SA). In 2011 PGM production (Pt, Pd, Rh, excluding Au) was 629,000 oz,[17] which is above the rough threshold of 500,000 oz/an for a basic (Pt, Pd, Rh & Au) PGM precious metals refiner (PMR). A scenario study by the World Bank forecasts that by 2018, output could increase to 29tpa and employment to over 10,000, at a cost of $1.8 billion in investments.[18] Such volumes would appear to be sufficient for a full PMR (Pt, Pd, Rh, Ru, Os, Ir and Au).

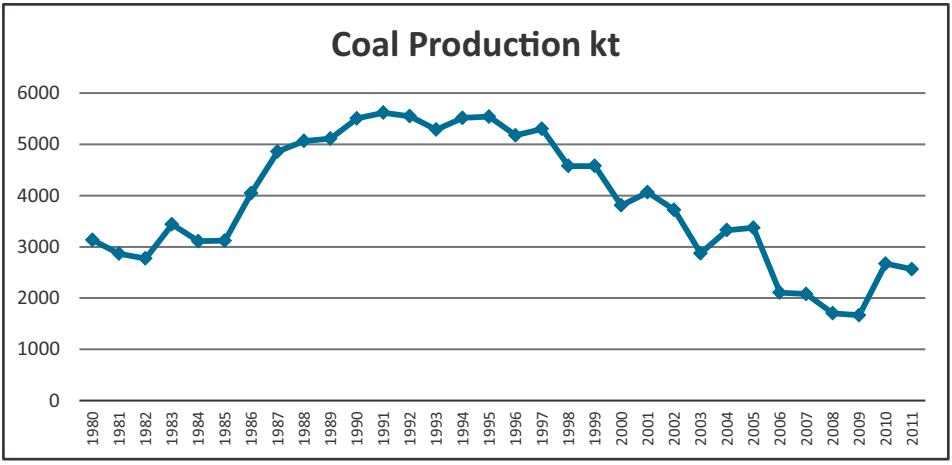
Small amounts of PGM concentrates are also contained in the residue of nickel-copper refining, when operational.

[16] Selous Metallurgical Complex (SMC).
[17] McMahon 2012
[18] McMahon 2012

2.4.3 COAL & COAL-BED METHANE (CBM)

Coal production over the 20 years between 1965 to 1985 remained fairly static between 3.0 and 3.5 Mt, however, production was substantially expanded in 1986 with the commissioning of an opencast operation to supply the new Hwange Power Station, at about 5 Mt annually.

Figure 9: Coal Production (kt), 1980-2011



Source: COMZ, 2012 (www.chamberofminesofzimbabwe.com)

Hwange Colliery Company Ltd. is a quoted company and is 40% owned by the state and 32% by the van Hoogstraten family (UK).[19] Nearly all coal production is for the local market – power (Hwange), the cement industry, agriculture and in the past, for coke production for Zisco and exports (Zimbabwe used to also export about 100 ktpa of coke, mainly to Zambia and DRC).

By-products from coke production are tar and benzole. A new distillation plant was constructed in Kwekwe in the 1990s by Zimchem which takes all tar and benzole from both the Hwange and Zisco coking plants (when operational), for the production of a variety of chemical products.

Oil-from-coal projects have been considered on and off since the 1950's and are once again under investigation, as are possibilities for gasification of Zimbabwe's substantial coal reserves and the tapping of the CBM reserves for production of ammonia for fertilisers, as well as power (CCGT).

RioZim owns the Sengwa coal deposit (>1.3Gt reserves) and have plans to build a 2GW power station based on this resource within the next 5 to 10 year period.[20]

The major coal resource areas are: 1) the Mid-Zambezi basin: Hwange (1900 Mtonnes), Gwai River Valley (3675 Mtonnes), Binga (3604 Mtonnes), Gokwe (1150 Mtonnes) and 2) the Sabi-Limpopo basin: Sabi-Lundi (379 ktonnes), Bubye (291 ktonnes) and Tuli (127 ktonnes).[21]

In addition, the Coal-bed Methane (CBM) resources in the Hwange/Lupane basins are estimated at over 27-40 TCF (trillion cubic feet) of sulphur-free methane gas, which rank Zimbabwe's resources at 11th globally, after South Africa (Table 5), but other coal basins are also known to have substantial CBM resources (e.g. the Sengwa Basin) which still need to be delineated.

[19] RMG 2012
[20] RioZim 2012 (www.riozim.co.zw)
[21] Morrison 1985

Table 5: World CBM Resources

Sl No.	Country	Coal Revenue (Billion Tonnes)	CBM Resources (Trillion cu. feet)
1	Cannada	7000	229 - 2697
2	Russia	6500	469 - 2598
3	China	4000	579 - 1200
4	USA	3970	448 - 900
5	Australia	1700	310 - 510
6	India	495	49.4 - 91.8
7	Germany	320	60.1 - 88.3
8	UK	190	38.8 - 60.0
9	Poland	160	49.4 - 70.6
10	South Africa	150	49.4 - 70.6

Source: Gupta, 2010[22]

There are plans for a thermal power station based on the Lupane CBM resources and the reserves are currently being appraised for this. CBM could also provide the feedstock for nitrogenous fertilisers and other methanol chemicals and could be used for the reduction of iron ore to iron/steel (DRI).[23]

The recent World Bank mineral production scenarios study forecasts a base-case of 9.8Mt by 2018 (6Mt from Sengwa) and a optimistic case 40Mt by 2018 ("investor friendly" case) which could subsequently expand to 82Mt.[24] However, beyond expansions to supply increased domestic power generation (base case), major exports will require huge investments into a new heavy-haul rail corridor to the Mozambican coast. A 40Mtpa railway will require between $3 and $4 billion in investment, but the resulting tariff could be as low as 3.5USc/t-km during capex repayments and 1.3USc/t-km once repaid. The latter would equate to a cost of around $13/t from Hwange to Maputo/Matola (about 1000km) or $14/t to the proposed new Port of Techobanine. Assuming a long-term international coal price of $70/t (currently $85/t FOB Richards Bay), mining plus concentration costs of around $15/t and a terminal cost of $3/t, a 40Mtpa project would appear to be viable even at the higher rail tariff of $38.5/t to Techobanine ($70-($15+$38.5+$3) = $13.5 = $540 million/an for 40Mtpa).

Table 6: Rough 40Mtpa heavy haul rail costs & tariffs for 1000km line

1000	km	40Mtpa
Capex (G)	G$	$3.6
Capex interest rate	%	3%
Repayment period	Years	16
Capex per ton	$	$90
Capex/t-km	$	$9.9
Tariff w/capex	USc/t-km	3.5
Cost w/capex	$	$32
Tariff opex only	USc/t-km	1.7
1st year opex only	Year	21
Cost opex only	$	$15

Source: Jourdan, 2012[25]

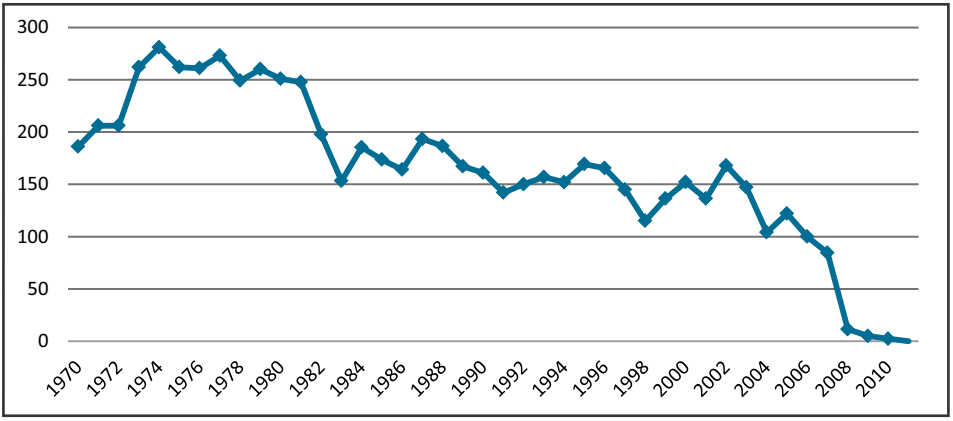
[22] Pramod Gupta 2010, Presentation to "Methane to Markets Partnership Expo 2010", New Delhi, India
[23] DRI: Direct Reduced Iron
[24] McMahon 2012
[25] Jourdan 2012: "Export options for the Waterberg Coalfields", confidential report for Genesis-Analytics, Johannesburg.

2.4.4 ASBESTOS

Asbestos mining peaked in 1974 at 281kt and between 1965 and 1978 it was the country's principal mineral in terms of the value of production but fell to second place behind gold from 1979 till the financial crisis when production collapsed and has not recovered with dollarisation.

The main producer was Shabanie and Mashaba Mines (Pvt) Ltd. which has three mines in the south of the country (Shabanie, Gaths and King mines), near Masvingo, and was owned by Turner Newall Plc (UK), but is now owned by Zimbabwean investors.

Figure 10: Chrysotile Asbestos Production (kt), 1970-2011



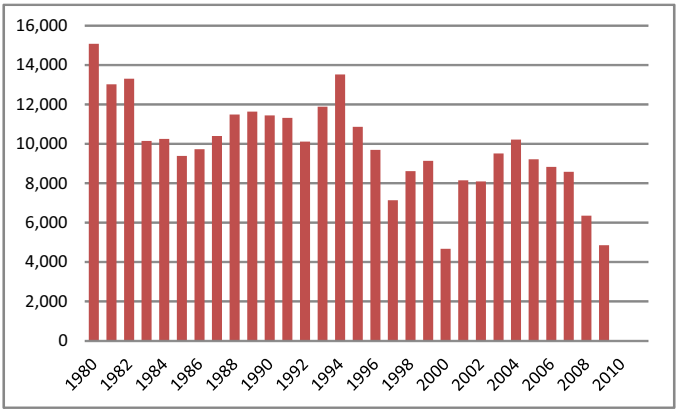
Sources: Jourdan, 1992 and USGS, 2012

Asbestos is increasingly being substituted for due to its perception as a health hazard in the West, but over the last few years the long fibre chrysotile (white asbestos) has been recognised as being a much less dangerous variety and new markets are opening up in Asia. By 2010 asbestos production had fallen to about 2kt. However, reserves are sufficient to return to previous production levels (>250ktpa), provided that markets and capital can be secured. A small proportion of production was consumed locally for the manufacture of asbestos cement products and the possibility of local asbestos spinning for the manufacture of fire-proof material was investigated in the 90s but no plant was built.

2.4.5 NICKEL

Anglo American Corporation of South Africa (AAC of SA) had the majority share in Bindura Nickel Corporation (BNC) of Zimbabwe which was bought by Mwana Africa (SA) in 2003-5. BNC used to operate two nickel mines located in the northeast of the country, namely Trojan and Madziwa (now closed), and two mines located in the southwest, Shangani and Epoch (now closed). It also operates a nickel smelter and refinery, BSR, at Bindura. In addition, nickel and copper matte was toll refined from BCL (Botswana) and other copper-nickel suppliers. In November 2008 Bindura Nickel Corporation was placed on care and maintenance, due to the hyper-inflation crisis. Mwana intends to reopen the operations as soon as it has secured the requisite capital. (It has had difficulty in raising offshore capital due to uncertainty surrounding the indigenisation policy.) It also plans to bring the Hunters Road nickel deposit into production, which has resources of 36.4Mt grading 0.55% nickel.

Figure 11: Nickel Production (tons), 1980-2010



Source: COMZ, 2012

Until 1982 nickel was produced by Rio Tinto Zimbabwe Ltd., but in that year the Empress Nickel Mine was shut down due to a combination of falling grades, depleted reserves and depressed prices. The Empress nickel refinery at Eiffel Flats started processing copper-nickel (Cu-Ni) matte from BCL's Selebi Phikwe mine in Botswana in the second half of 1985 after having been closed for two years and has continued to toll-refine since (currently around 8kt/an of Ni).

The World Bank scenario study forecasts a base-case production of 10.2ktpa nickel by 2018 and an optimistic scenario (assuming policy changes) of 20ktpa and employment of 1400, requiring investments of $186 million at a cost of $62 million.[26]

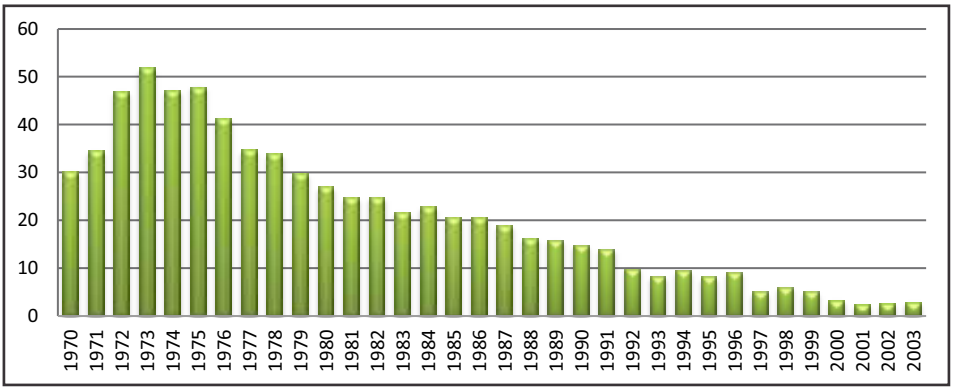
2.4.6 COPPER

Copper peaked in 1973 at 52 kt, but since then it has steadily declined to a low of 2.3kt in 2003. The large majority used to be produced by companies under the parastatal ZMDC, namely, MCM (Mhangura Copper Mines, now closed) and Lomagundi Smelting & Mining (LSM, also closed), with smaller amounts produced as a by-product from the nickel mines (Bindura). The ZMDC took over the interests of the Messina group of South Africa in 1982. The main reason for this intervention on the part of the state appears to have been the depressed price of copper causing Messina to threaten to shut down some of the poorer mines or, failing that, to withdraw completely. All the mines used to be in the centre-north part of the country in the Lomagundi district near Chinhoyi. The Asian boom high copper prices did not trigger a reopening of operations due to the domestic economic crisis, but dollarisation is likely to lead to a reassessment of the remaining resources.

ZMDC has also considered a new mine, Copper Queen, 90 kin to the west-southwest of the town of Alaska. The ore grades at 1.3% Cu, 1% Pb and 3.4% Zn, with significant amounts of silver. Geological reserves stand at 8 million tonnes of sulphide ore, but the economic crisis pushed the project onto a back-burner. It could make the country self-sufficient in lead and zinc which are presently imported. The main problems with the project appear to be the complex mineralogy and in raising the capital. The World Bank scenario study makes no forecasts for the reactivation of copper mining.

[26] McMahon 2012.

Figure 12: Copper Production (kt), 1970-2003



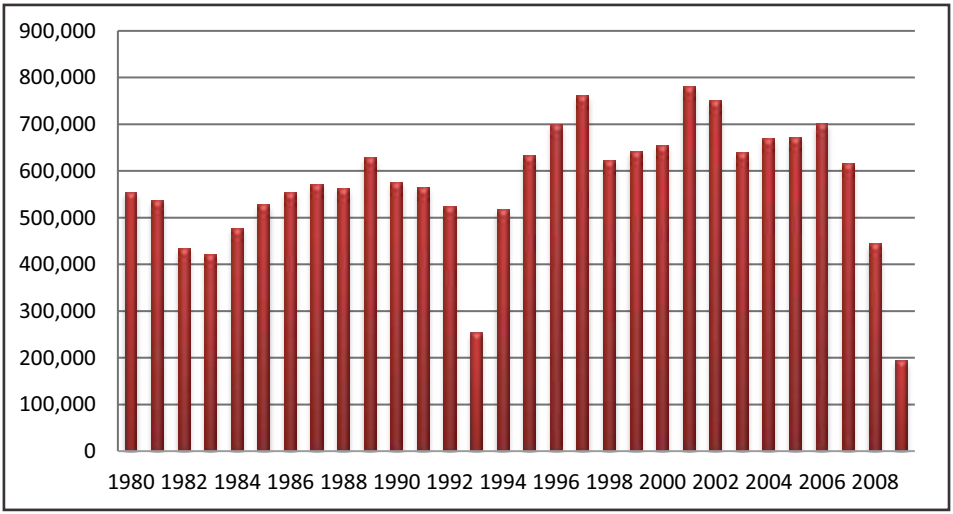
Source: Jourdan, 1992 & COMZ, 2012

Bindura Nickel Corporation, used to produce a small amount of copper (~1000tpa) at their refinery BSR at Bindura and from toll-refined matte from BCL in Botswana. The RioZim Empress Nickel Refinery at Eiffel Flats also used to toll-refine about 17.5ktpa of matte from BCL and Tati Mines in Botswana. About 3,000 tonnes/an. of cathode copper used to be consumed locally by Cafca (wire and cables), Almin Industries, various copper alloy foundries and by a copper chemicals manufacturer (Cecon).

2.4.7 CHROMITE

Chromite ore was first mined in 1906 and first exported in 1907. Production peaked in 1975 at 876kt before falling to a 20 year low of 431kt in 1983, a drop of 51%. Since then it recovered 780kt in 2001 and then collapsed to 194kt in 2009.

Figure 13: Chromite Ore Production (tons), 1980-2009

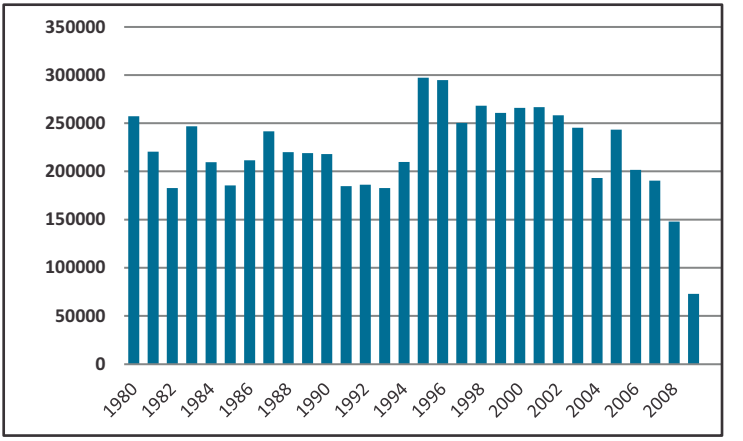


Source: COMZ, 2012

Exports of ore fell off rapidly from 1968 to zero by 1984 due to the increasing off-take by the ferrochrome smelters. Zimbabwe Mining and Smelting Company (Zimasco), is the main producer and has four mines (Shurugwe, Valley, Lalapanzi and Mutorashanga) and a smelter in Kwekwe. Forecast production for 2012 is at ~480kt of chromite ore and

~170kt of FeCr alloy.

Figure 14: Ferrochromium Production (tons), 1980-2008



Source: COMZ, 2012

Zimbabwe Alloys (Zimalloys) Limited had four mines (Great Dyke, Caesar, Netherburn and Inyala), a quartz quarry (Broadside) and a smelter which was commissioned in 1953 and is situated in Gweru. Ore was also purchased from cooperatives, tributors and contractors. All of the mines, except Inyala, used to exploit the thin seams of the stratiform deposits of the Great Dyke where mining is expensive and the friable chromite ore produced needs to be agglomerated before smelting, adding significantly to costs. A local company Benscore Investments, bought the company from Anglo American in 2005. Zimalloys raised $60 million in 2012 to reactivate production to 250ktpa of alloy.[27] It reportedly controls 30% of the country's chromite reserves.

Zimbabwe has the world's largest reserves of high-chromium chromite ores estimated at between 580Mt and three billion tonnes, the large majority of which are the stratiform seams of the Great Dyke. The latter figure represents 84% of world high-chromium reserves. Due to technical advances in stainless steel making the Zimbabwean high-chromium ores have lost their premium on the world market, but ferrochromium alloys made from it are still favoured by steelmakers.

The World Bank scenarios study forecasts that by 2018, Zimasco will produce ~550kt of chromite and ~300kt of alloy (base-case) and ~450kt of alloy under an optimistic scenario, requiring an investment of about $355 million.[28] If the Zimalloys reported figure is added then national alloy output could reach 550kt (base-case) and around 800kt (optimistic case) by 2018.

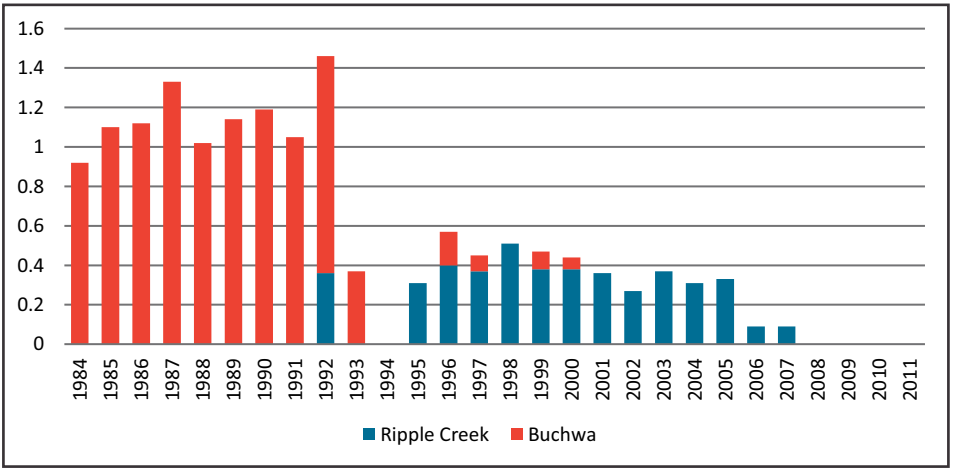
Although Zimbabwe produces all the constituents of stainless steel (ferrochrome, nickel and iron) there are no plans for the creation of a plant for its production. Small amounts of stainless, however, are produced on a "once-off" basis by the small foundries for stainless castings and Zimalloys had an embryonic plan for the production of high grade stainless precision castings in the early 90s, which came to naught. The production of calcium carbide was investigated for the future supply of the domestic market for acetylene and, possibly, PVC's, and a pilot furnace was commissioned, but the project was abandoned in the 90s.

[27] The Herald 7th June 2012
[28] McMahon 2012

2.4.8 IRON AND STEEL

Iron ore production peaked in 1992 at 1.46 Mt, and then fell to zero in 2008. Exports of iron ore ceased in 1968 and since then, all ore has gone to the Zimbabwe Iron and Steel Company Ltd. (Zisco). Zisco is almost completely state owned and started operations in 1948 at Redcliff near Kwekwe in the centre of the country. Iron ore is produced by its 100% subsidiary Buchwa Iron Mining Company Ltd. (Bimco) from two mines (Buchwa and Ripple Creek) and is all destined for its iron and steel works. Overall grade at Buchwa is 61.6% iron (Fe) and 0.2% manganese (Mn). However, current run-of-mine (ROM) reserves at Buchwa are almost exhausted and a sintering plant was established to handle the friable Ripple Creek ore, which became the principal feed from 1995. Reserves of limonite ore at Ripple Creek are around 40 Mt, grading 51.4% Fe and 2.1% Mn. BIMCO also has claims over the huge Mwanesi Range low grade (40% Fe) BIF[29] resource, estimated at over 30Gt[30]

Figure 15: Iron Ore Production Mt (Bimco), 1984-2011



Source: RMG database, 2012

Roughly 80% of iron and steel production used to be exported when Zisco was operational. Zisco had a maximum capacity of one million tonnes and was the only integrated steelworks in the region outside South Africa, with much of its exports going to regional customers.

There has been no ore or steel production since 2007 due to the economic meltdown and Zisco's unserviceable debt burden. In March 2006, India's Global Steel Holdings was given a 20 year management contract for the steel plant, but the deal fell through. In March 2011, Essar Africa Holdings (a member of the Essar Group of India) and the Government of Zimbabwe announced that they had reached an agreement for the revival of Zisco and in December 2011, Essar Group announced that two JVs had been set up between Essar Africa Holdings and the Government of Zimbabwe, which would acquire all steel and mining related assets of Zisco and its subsidiaries. The JVs are NewZim Steel Private Limited (tasked with developing ZISCO's steel-making capacity) and NewZim Minerals Private Limited, which will acquire the Buchwa Iron Mining Company Ltd. and develop its assets. Essar Africa Holdings will have a 60 % stake in NewZim Steel and an 80 % stake in NewZim Minerals and Essar will reportedly invest $750M in the deal. However, it has also been reported that Bimco will be transferred to the ZMDC which would then do a JV with Essar.

It appears likely that Essar are really after the huge low-grade Mwanesi resource (33Gt of ore at 40% Fe) that could be upgraded and feasibly support a massive iron ore export project of 80Mtpa, via Mozambique. This is discussed in greater detail in section 3.10.2 case study: The Putative Mwanesi Development corridor as a spatial Development Initiative (SDI), under the discussion of Spatial Linkages. If the Mwanesi Range resources were instead put out to tender against a massive iron ore export corridor to the Mozambican coast and iron/steel value-addition, then ore exports could reach 80Mtpa by 2018 and iron/steel exports 3-5Mtpa which could generate profits of around $3 billion per annum. This could eventually contribute about $1.5 billion/annum to the fiscus, once the threshold ROI of the proposed 50% Resource Rent Tax is breached (see section 3.6.3: Fiscal Proposals).

[29]BIF: Banded Ironstone Formation
[30]Worst 1962

Table 7: Rough 80Mtpa heavy haul rail costs & tariffs for 1000km line

Element	Units	80Mtpa*
Capex (G)	G$	$7.5
Capex interest rate	%	3%
Repayment period	Years	16
Capex per ton	$	$94
Capex/t-km	$	$10.3
Tariff w/capex	USc/t-km	3.5
Cost w/capex	$	$32
Tariff opex only	USc/t-km	1.3
1st year opex only	Year	21
Cost opex only	$	$11
**80Mtpa option is electrified dual line*		

Source: Jourdan, 2012[31]

2.4.9 DIAMONDS

Kimberlites: There are numerous kimberlite pipes in Zimbabwe but most are not diamondiferous. The River Ranch kimberlite pipe was discovered by De Beers in 1974 but went through several changes of ownership and is now caught up in disputes around the estate of the late General Mujuru. It was never a major producer but reportedly still has resources. In 1997 RTZim (Rio Tinto Group) discovered Murowa pipes (~40km from Zvishavane) and mining started in 2004 (reserves are estimated at ~20Mt of ore). In 2011 it produced 367,000 carats and 565,000 carats are forecast for 2012.

Alluvial: In 2006 alluvial diamonds were discovered in the Chiadzwa area of Marange District (~90km SW of Mutare), which led to a chaotic "diamond rush" until the state stepped in and regularised the workings through the creation of several joint ventures (JVs) with ZMDC. In 2011 production from the four JVs was around 9M ct and 11M ct are forecast for 2012. However, due to the secrecy surrounding the Marange operations the current production figures could be significantly higher. Unlike elsewhere in the world where alluvial deposits generally have a higher gem proportion and unit value than kimberlite deposits, the value of the Marange diamonds averages about 25% less than the Murowa ones.

Table 8: Zimbabwe Diamond Production, Exports & unit value

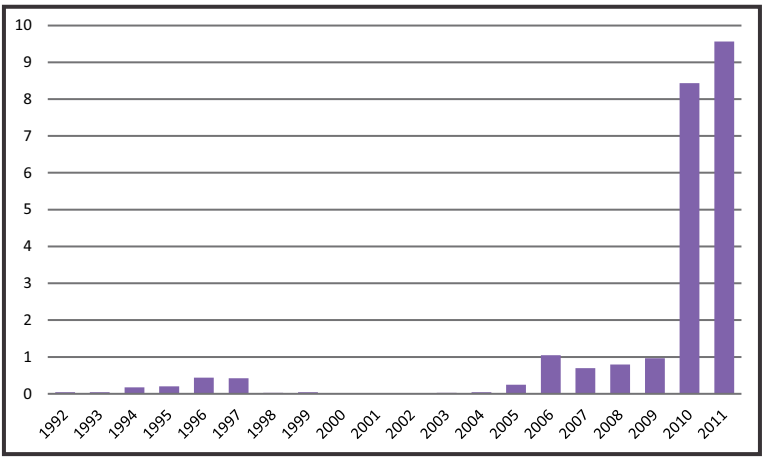
Year	Production (ct)	Exports (ct)	Exports(MUSD)	Export Price ($/ct)
2003	26 870	26 870	2 219	82.58
2004	44 454	18 481	3 582	80.58
2005	248 264	261 538	39 429	158.82
2006	1 046 026	264 585	30 057	28.73
2007	695 015	489 170	23 377	33.64
2008	797 198	327 834	26 693	33.48
2009	963 502	1 349 172	28 901	30.00
2010	8 435 224	8 424 384	320 237	37.96
Total	12 256 553	9 812 862	474 495	38.71
2011	(9 565 000)	NA	NA	
Total	24 513 106			

Sources:Kimberly Process 2012, www.kimberleyprocess.com

The World Bank mineral scenarios study estimated that diamond output could increase to about 16M ct and employment to about 1500 by 2018. The study also notes that, due to the stockpile built up during the Kimberly Process Certification (KPC) there could be a backlog worth $1 billion to $5 billion which will be put on the market in the next few years which could result in a fiscal "windfall".[32]

[31] Jourdan 2012: "Export options for the Waterberg Coalfields", confidential report for Genesis-Analytics, Joburg.
[32] McMahon 2012

Figure 16: Diamond Production Mct, 1992-2011



Source: KPC and USGS, 2012

2.4.10 OTHER MINERALS

The most important by value were: limestone, phosphates, silver, graphite, lithium minerals, tantalite concentrates, cobalt and rough emeralds. The most important of these in terms of world output, is lithium (petalite concentrate) which was approximately 7.6% of world production in 1988. All lithium minerals were produced by Bikita Minerals (Pvt) Ltd., which used to be owned by RTZ plc (50.5%), but is now Zimbabwean owned. The Bikita Mine (60km east of Masvingo) is one of the richest lithium pegmatites in the world (1.4% Li). Reserves are estimated at 11 Mt of caesium-petalite (largest petalite deposit in the world) and production runs at about 60ktpa of Li/Cs ore.

Figure 17: World Lithium Resources

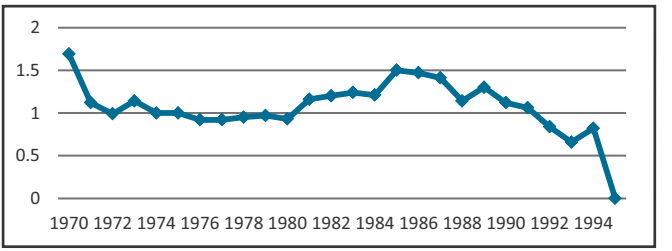
Almost all limestone quarrying was for cement production at Cleveland (about 500 kt/y), Sternblick (about 400 kt/y), Sino-Zim (about 300 kt/y), and for steel production at Zisco (about 430 kt/y), but these contracted during the economic crisis (Zisco has shut down) and are now returning to full capacity. Small amounts are also quarried for lime production (Early Worm Mine) and for agriculture (Springbok). There are also numerous other known deposits with large reserves, but none with the specific characteristics necessary for the Zimalloys ferrochrome plant which has to import low sulphur and phosphorus lumpy lime from South Africa.

Virtually all silver production, is a by-product of other mining, mainly from copper and gold production. Antimony is also produced as a by-product of gold production (Indarama) and by some small mines such as Belingwe Star. Most of the country's graphite production is from Zimbabwe Germany Graphite Mines Ltd.'s Lynx mine in Hurungwe District, jointly owned by ZMDC (50%) and Grafitwerk Kropfmuhl AG (50%) of Germany. Tantalum concentrate production comes from

small-scale pegmatite workings, but in the past as a by-product of tin mining (Kamativi). Small quantities of tungsten concentrates are also produced from pegmatites such as R.H.A. mine and Richardson Kop.

Tin production peaked in 1985 at 1.5 kt but output declined due to depleting reserves and ceased in 1994. Kamativi Tin Mines Limited (KTM) in the west of the country was responsible for almost all of the tin production. Small operations started on the pegmatite in 1936 and in 1970 the state Industrial Development Corporation (IDC) took a majority share (later transferred to ZMDC in 1986). The mine is also used to produce small amounts of tantalite, spodumene (Li) and beryllium. ZMDC is reassessing the viability of reactivating the mine.

Figure 18: Tin Production (kt), 1970-1994

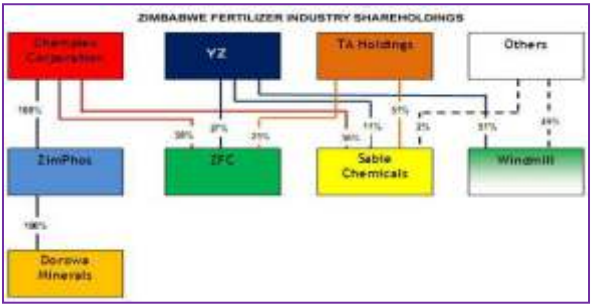


Source: USGS (various years)

Phosphate rock (apatite) is produced by Dorowa Mining (Pvt) Ltd. in the Nyazura district, for their mother company, Zimphos, for fertilizer production. Zimphos produces single and triple phosphate after treating the ore with sulphuric acid.

Zimphos is a wholly-owned subsidiary of Chemplex Corporation which was in turn owned by AECI of South Africa, (Anglo American), but the foreign (AECI) holding was bought out by the state Industrial Development Corporation (IDC), Norsk Hydro of Norway (now Yara Zimbabwe) and local shareholders in 1990. The current structure is presented in Figure 19.

Figure 19: Fertiliser and Explosives Industry Shareholdings



ZFC: Zimbabwe Fertiliser Corporation; YZ: Yara Zimbabwe

Source: Chemplex, 2012[33]

Sulphur occurs in iron pyrite and is mined at the Iron Duke mine near Mazowe (ex Anglo American Corporation). Output used to be about 50ktpa and was all destined for the Zimphos sulphuric acid plant in Msasa for phosphatic fertiliser production (Zimphos)

Bauxite production used to come from the Alumina mine belonging to E.C. Meikle Ltd., on the eastern border, but since 1987 all production has come from the other side of the border in Mozambique.

Magnesite production is mainly destined for export to South Africa, except for a small amount which is used for the production of fertilizer. It is mined by Kadoma Magnesite at the Barton Farm Magnesite Mine. Several other deposits are

[33] www.chemplex.co.zw

also known (Mat Mine, Calac Deposit and Bukwa Magnesite). The possibility of producing magnesite refactory bricks was investigated by the ZMDC as a SADC regional project before the economic meltdown.

Gem stones come from numerous small workings and include aquamarine, beryl, citrine, amethyst, garnet, iolite, tourmaline, chalcedony and emeralds. The only large scale production was from the Rio Tinto emerald mine, Sandawana (now ZMDC).

Kyanite production is from ZMDC's Ky mine in the north-east. It is consumed locally by the ferrochrome smelters as a flux and is used for the manufacture of fire assay crucibles. Talc is produced from several operations but most production comes from Manzonzo and Simon mine for the filler and cosmetics industries.

Clay production was almost all from the Bemas and Corbut pit (for cement) and the Gwaai River Clay deposit (for ceramics) from the clay horizons in the lower Karoo coal measures at Wankie for the manufacture of refractory bricks by Clay Products Ltd. in Bulawayo, mainly for the steel industry. Production of kaolin is mainly from the Athi pit for the ceramics industry and mica production started in 1919, peaked in the early fifties and was virtually dead by 1960. And the last producer was the Turning Point Mine. Most of the feldspar production was a byproduct of lithium production at Bikita. It was also produced by the Mistress Mine near Harare, mainly for the glass and ceramics industries. Vermiculite is produced for export from the James Mine.

Although the total value of industrial mineral production is low in comparison to the major export minerals, they are in some ways more vital to an integrated resource-based industrial development than the export minerals which are vertically integrated into the industrialised economies.

2.5 FUTURE PROSPECTS

A survey carried out by the COMZ estimates that the mining sector requires between $3-5 billion dollars investment to increase capacity to an average of over 80% within the next three to five years. Table 9 shows funding requirements by mineral.

Table 9: Future Mining Investment Requirements to Grow Production by 80%

Mineral	Minimum Funding Requirement ($G)	Output Growth by 2015
Gold	1.00	455%
PGMs	1.20	40%
Ferrochrome	0.25	160%
Nickel	0.11	400%
Coal	0.28	218%
Diamonds (Kimberlite only)	0.30	100%

Source: COMZ, 2012[34]

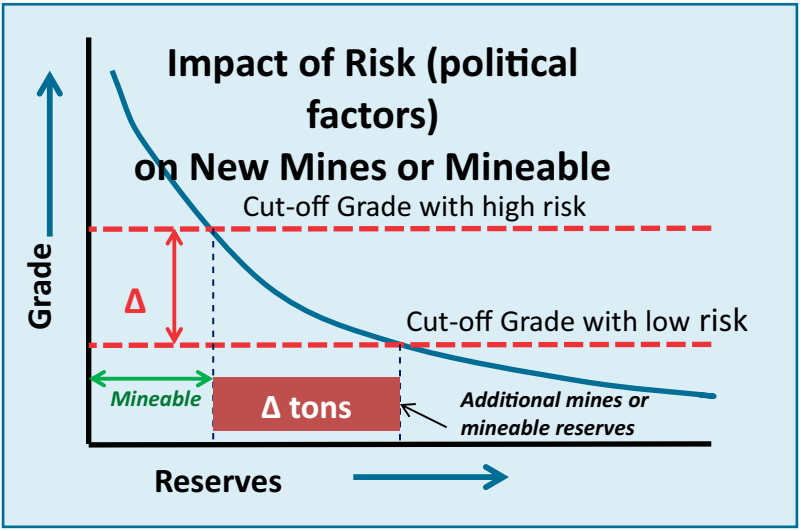
According to Hawkins (2009) there are seven main constraints to increasing mineral production:

1) "Policy uncertainty and unpredictability.
2) The supply of skills.
3) Physical infrastructure – most notably electricity, but also transport and water.
4) Macroeconomic policy – specifically exchange rate and inflation management.
5) The fiscal regime.
6) Corporate and national governance – restrictions on foreign ownership, extent of compulsory state participation in ownership (if any), remittance of dividends and management fees, and official interference in operational decision-making.
7) National sustainability strategy – government policies designed to influence the nature and pace of resource exploitation."[35]

The recent World Bank study on future mineral sector scenarios (McMahon, 2012) asserts that once there is a good knowledge of mineral resources there "are three main factors that can enhance or constrain the development of a mine: availability of transport infrastructure, access to power, and the policy and fiscal regime impacting the mining sector."[36] On skills constraints, it claims that these can be imported, though it notes that there is also a global shortage. However, the import of skills should be a last resort as foreign professionals often constitute a "5th column" in terms of hampering development of backward and forward linkages (mining inputs and beneficiation), as they tend to favour familiar imports and off-shore processing options. The priority should always be on developing local skills and attracting the large Zimbabwean skilled diaspora to return home.

[34] COMZ 2012, www.chamberofminesofzimbabwe.com/economics/industry-development-a-outlook.html
[35] Hawkins 2009 (UNDP), p32
[36] McMahon 2012, p15

Figure 20: Impact of Political Risk on Mineable Resources



Although the policy environment is important for attracting investment into mining, geological prospectivity and known resources could be as important. This is evidenced by major investments into risky jurisdictions such as the DRC and Guinea, but which have high prospectivity and known spectacular resources. Consequently the infrastructure (power, transport, water) is probably the bigger constraint for Zimbabwe, especially for bulk minerals such as iron ore and coal. Also, the indigenisation policy has put on hold several lower return investments that were in the pipeline. The general impact of "political risk" is similar to the impact of increasing royalties (see figure 38: Conceptual Impact of Royalty on Expolitable Resources). It will increase the necessary investment hurdle rate (return on investment, or ROI) and consequently increase the requisite cut-off grade to generate the higher hurdle rate, thereby sterilising resources on existing mines and rendering non-viable potential new mines (see Figure 20 above). Higher infrastructure costs (power & transport) will have the same effect of rendering viable only the higher grade deposits or reserves.

The World Bank study base-case (current infrastructure and policies) predicts that by 2018 mineral revenues could be nearly $5 billion, fiscal revenues over $700 million and employment at 33 thousand, but at an investment cost of $5 billion (Table 10). This excludes the reactivation of iron ore mining for ZISCO and asbestos mining.

Table 10: 2018 World Bank Base-case Projections (Current Infrastructure & Policies)

Mineral / Metal	Production	Gross Revenues ($M)**	Fiscal Revenues ($M)	Employment	Investment (MUSD)
Gold koz	845	1,344	253	15,200	420
PGM koz	690	776	50	8,200	816
Diamonds, kimberlitekct	565	99	26	430	0
Diamonds, alluvial Mct	12	600	169	1,000	0
Coal Mt	9.8	735	61	3,750	3,000
Chromite orekt	549	115	1	(under FeCr)	85
Ferrochrome (FeCr) kt	306	840	76	3500*	0
Nickel kt	19	301	93	870	62
TOTAL	-	**4,810**	**729**	**32,950**	**5,023**

*including chromite ore. ** 15 July 2012 prices.

Source: McMahon, 2012

"In the base case most of the expansion is due to the revitalization of many gold operations (due to the continued very high prices), the recapitalisation of Hwange, the reopening of the nickel mine, and the increase in diamond production at Marange. In fact, it is likely that the majority of the difference in the base 2018 scenario and the optimistic or investor friendly scenario is due to the embedding of the indigenisation policy in a general scenario of political instability".[37]

The optimistic ("investor friendly") case estimates that by 2018 mineral revenues could be over $11 billion, fiscal revenues over $1.5 billion and employment above 56 thousand, with investments $11.7 billion (Table 11).

Table 11: 2018 World Bank Optimistic Projections (No Infrastructure or Policy Impediments)

Mineral / Metal	Production	Gross Revenues ($M)**	Fiscal Revenues ($M)	Employment	Investment (MUSD)
Gold koz	2,510	3,991	759	27,600	2,500
PGM koz	995	1,119	81	10,300	815
Diamonds, kimberlitekct	1,000	175	45	800	100
Diamonds, alluvial M ct	15.2	760	214	1,000	150
Coal Mt	40	3,000	242	6,000	7,000
Chromite orekt	539	113	1	(under FeCr)	0
Ferrochrome (FeCr) kt	447	1,229	99	7,100*	340
Nickel kt	28	459	142	1,400	186
Iron ore Mt	2.5	225	3	2,000	600
TOTAL	**-**	**11,071**	**1,587**	**56,200**	**11,691**
*including chromite ore. ** 15 July 2012 prices.					

Source: McMahon, 2012

However, these projections exclude major expansions for the export bulk minerals (iron ore and coal) and any reactivation of asbestos or copper mining. If the development of an iron ore export corridor for the huge Mwanesi iron ore resource goes ahead (80Mtpa), with expanded iron/steel exports, and a heavy-haul coal export rail link to Mozambique is established (40Mtpa), then the gross revenues could be more like $24 billion and fiscal revenues over $3 billion, without the introduction of a Resource Rent Tax (RRT). The introduction of a RRT for all mining of 50% (once a "normal" ROI is achieved) could generate annual fiscal revenues in the order of $6 billion per annum, once the ROI threshold is surpassed, using the above expansions in production and current prices.

Even the World Bank report base-case is constrained by the current power shortages. The scenario presented in Table 10 would need an estimated 700MW of capacity (Table 12). Accordingly, power is arguably the greatest constraint to an expansion of the minerals sector and the planned rehabilitations and expansions should be urgently expedited with a parallel assessment of short to medium term import options.

Table 12: Additional Power for Potential Mining Expansion

Mineral/Metal	Production increase	Power per unit (kWh)	Additional Power Needs (M kWh)
Gold	2.23M oz	1000	2,230
Iron Ore	2.5Mt	120 (to pig iron)	300
Steel	1.2Mt	700	840
Nickel	28,5 kt	600	17
Coal	35Mt	40	1,400
PGM	325,000 oz	610	198
Ferrochrome	285 kt	4000	1,140
Diamonds	6.8m carats	8*	54
Total			6179M kWh
Additional capacity required			692 MW
* assumes a grade of 1ct/t.			

Source: McMahon, 2012

[37]McMahon 2012, p18

2.6 MINERALS MARKETING

Before 1983 marketing was done by the companies, usually through agents in the OECD countries. Up until the beginning of 1980 sanctions were applied to the then Rhodesia, so the marketing methods tended to be devious and clandestine. Since 1983 all mineral exports, except gold, have been controlled by the Minerals Marketing Corporation of Zimbabwe (MMCZ) which was set up by government in 1982 officially to rationalise selling arrangements, remove restraints on minerals trade and to reduce costs to producers, but unofficially to eliminate transfer pricing.

It was initially received by the industry, especially the TNC's, with great foreboding and they fought unsuccessfully against its establishment. However in the 80s and 90s they appeared to have come to terms with it, particularly as, in some instances, higher prices have been obtained and middlemen have been eliminated and, more importantly, in many cases previously established agents and channels are still being used. There have, however, been well-documented instances where these agents have been receiving inflated commissions and have not always managed to obtain the optimal world market price for the minerals sold.

Although the initial establishment of the MMCZ was seen as a victory of the government's "socialist" policies immediately after independence, there appears to be good evidence that the inefficiency of the MMCZ may be more expensive than the losses through transfer pricing. A confidential assessment of the MMCZ in 1990 concluded that millions of dollars were being lost, not only through inefficiency and the use of old TNC agents, but also possibly through corruption, but the issue was not taken up by the Attorney General's Office (cited in Jourdan 1990). The range of Zimbabwe's mineral exports and the generally small quantities of any one mineral make it difficult for the MMCZ to have people proficient in all aspects of all minerals traded. A minerals marketing monitoring commission might possibly be a more appropriate strategy given the skills constraints of the MMCZ, where spot checks were made on random deals, possibly using outside consultants, with heavy penalties for transfer pricing.

2.7 LABOUR

Workers committees were instituted shortly after independence in 1980. The principal workers union is the Associated Mine Workers Union of Zimbabwe (AMWUZ), which is affiliated to the Zimbabwe Congress of Trade Unions (ZCTU). Minimum wages are set by government in consultation with the companies and the union, but from 1980 until the "hyper-inflation" the minimum only barely kept pace with inflation. Since dollarisation wages have stabilised. There have been extremely few work stoppages or strikes and most that have occurred have been over specific mine related problems rather than the national minimum wage rates or rights of workers.

A large proportion of mine labour used to be foreign (60% in 1965 and 47% in 1972),[38] mainly Malawians and Mozambicans, but since independence most of them have been naturalised. The slump in metal prices in the mid-eighties had a severe effect on the union; membership fell from roughly 30,000 in 1980 to 20,000 in 1985 then grew to 31,000 in 1989, representing over half of the workforce. Membership shrunk dramatically during the economic meltdown, but by 2011 AMWUZ membership had recovered to 25,000.

The Labour Relations Act of 1985 got a mixed response from both workers and management. From the workers' point of view, the positive aspects of the Act are the right to join a union, protection from discrimination, protection of union officials from victimisation and that the employer will in future send union dues direct to the union and non-members maybe levied. Since 1980 permission from the Ministry of Labour and Social Services has been necessary in order to fire or lay-off a worker.

On the negative side are severe controls on the right to strike and the wide discretionary powers given to the Minister of Labour who can nullify union congress election results and control the use of union funds. In the opinion of the union the Act attempts to limit union struggle to economic objectives only thereby depoliticising union activity.

Other legislation affecting mine labour is the Emergency Powers Act, the Pneumoconosis Act, the Workers Compensation Act and the Mines and Minerals Act which has Health and Sanitation Regulations.

Up till the recent economic crisis, the frequency of expatriates on foreign contracts was extremely low, but the number of professional and managerial staff from the "settler" section of the population was extremely high at over 60%. Very few indigenous professionals and managers were produced for the mining industry during the racist colonial/settler period. This improved over the 1980s and 1990s, especially through mining company in-house training, but there was a massive loss of indigenous skills during the first decade of the 20th century, due to the economic meltdown.

In the 1980's a Department of Mining Engineering and a Department of Metallurgical Engineering were opened at the University of Zimbabwe with West German aid. The University also has a long-standing Department of Geology, a geophysics section under the Physics Department, and an Institute of Mining Research. At a technical level, there is a School of Mines in Bulawayo for the training of mining and mineral processing technicians. However, all of these were devastated by the economic crises over the period 2000-2008 and have still not recovered.

[38] Chamber of Mines of Zimbabwe (COMZ) 1973, "Annual Report", page 113

2.8 LEGISLATION

The right of searching for and mining of all minerals is vested in the President, in terms of the Mines and Minerals Act. To prospect a prospecting licence or an Exclusive Prospecting Order (EPO) must be obtained by or with an Authorised Prospector. An EPO is valid over a defined area, for a limited time period and for the defined mineral/s only. From this right stems the right to peg a claim and dispose of the minerals won in perpetuity, so long as minimum work is done or retention fees are paid. Unlike other countries in the SADC no special mining licence is required. The land owner is recompensed for the loss of the land use at a nominal rate by government.

In terms of tax, repatriation of profits and other fiscal matters, the mining companies fall under the general laws governing these aspects for the whole of the economy. However, in 1989, with the launching of the New Investment Code, it was announced that a new tax regime specifically for mining was to be formulated that would take into account the high risk nature of the mining industry. Corporate income tax (CIT) is 25% of the taxable income of the company. In terms of mining companies the following allowances apply: They can deduct the initial capital expenditure as it is incurred or over a number of years over the life of the mine up to a maximum of ten years; expenditure incurred in exploration can be deducted immediately or carried forward and allowed against subsequent mining income; a depletion allowance of 5% of the value of mineral production and a replacement allowance for later capital expenditure are both deductible.

In the seventies legislation existed for the payment of royalties by mining companies at the rate of 4% of output value but was suspended in an arrangement to encourage the companies to install local beneficiation plants (the Alaska copper refinery was built under this scheme) and apparently was reapplied due to the depressed metal markets in the eighties.

New foreign venture capital may be fully repatriated after two years after deducting amounts already remitted. The balance can then be remitted over six years in equal amounts with the interest accrued. Under the 1989 Foreign Investment Code, investments accorded Venture Capital status will have a minimum remittability of 50%, negotiable to 100%, of after tax profits as dividends which are then subjected to a non-residents shareholders tax of 20%, unless there is a tax agreement with the country of origin of the investment, such as exists with the United Kingdom (5%) and the Federal Republic of Germany (10%). In addition to being a signatory to the UNCITRAL and International Chamber of Commerce agreements, in 1989 Zimbabwe agreed to subscribe to the MIGA system for the protection of foreign investments and for arbitration to be settled under the Convention on the Settlement of Investments Disputes between States and Nationals of other States.

Mining companies with more than 25% foreign ownership may not borrow locally more than 35% of the shareholders' funds plus the ratio of the local share interest to the foreign share interest multiplied by the 35% of the shareholders' funds, or they lose the right to repatriate profits (for other companies 25%). This formula is to encourage foreign concerns to bring new, foreign, capital into the country for new capital investment. It also encourages locally incorporated foreign companies to raise capital for local expansion by increasing the equity base locally, thereby diluting the foreign holding.

From independence to 1995 there was virtually no new foreign investment in mining other than RTZ plc (Renco gold mine, 6 MUKP in 1980) and Cluff Minerals plc ($5M in the Freda-Rebecca gold mine in 1987/8). The reasons for this were the depressed outlook for base metals over most of the period, the low proportion of profits that could be repatriated (35% until 1989) and the perceived regional instability arising from the South African apartheid regime's erstwhile policy of destabilisation of neighbouring states.

In the 90s the MMA was amended to cater for a Special Mining Lease (SPL) for the large BHP/Utah PGM investment. An SPL has its own regime in terms of CIT (15%), royalties (4%), an Additional Profits Tax (APT) and the freedom to market mineral production. To date there are only two SPLs- Zimplats (Implats) and Unki (Angloplats).

Royalties and fees have recently been dramatically increased and now constitute a significant cost factor and deterrent to investment (see Table 13.)

Table 13: Changes to Royalties and License Fees

	Gold	Diamonds	PGM	Coal
Old Royalty	4.5%	10%	5%	
New Royalty	7%	15%	10%	1%
Old fees	NA	$1 million and nil	Varied; less than $50,000 in total	$5000 and $100,000
New fees	NA	$1M application fee for prospecting and $5M registration fee for a claim, which includes mining if feasible deposit	$500,000 application fee and $2.5M registration fee	$100,000 application fee and $500,000 registration fee
Gound rental	NA	From nil to $3000/ha	From nil to $1000/ha	From nil to $100/ha

Source: McMahon, 2012 (from Chamber of Mines of Zimbabwe)

Although it is not aimed specifically at the mining sector, the Indigenisation and Economic Empowerment Act of 2007 also has major consequences for investment and development in the mining sector. These issues are discussed below in section 3.6 Mineral Fiscal Linkages.

3. MINERAL POLICY ANALYSIS: MAXIMISING THE DEVELOPMENT IMPACT

3.1 MINERAL REGIMES

African mineral regimes, including Zimbabwe, are essentially based on the principle of "free mining", or 'free entry'. Barton[39] defines free mining as including:

> "a right of free access to lands in which the minerals are in public ownership;
>
> a right to take possession of them and acquire title by one's own act of staking a claim; and
>
> a right to proceed to develop and mine the minerals discovered" (p. 193).

The mining laws broadly fit into the African mineral regimes reformulation process initiated and/or sponsored by the World Bank from the late 1980s until the present. In this regard Professor Bonnie Campbell notes in the *Canadian Journal of Development Studies:*[40]

> *". . . certain elements of the free mining doctrine that animated the nineteenth-century formulation of mining regimes in the American and British spheres have also guided the liberalisation process of African mining regimes over the 1980s and 1990s. One of the ways this came about was through the retrenchment of state authority, which in turn contributed to the institutionalisation of asymmetrical relations of power and influence that had important consequences for local political processes, local participation, and community welfare. The approach consequently helps explain some of the social, economic, environmental, or human rights impacts of these regimes, and prompts one to question the extent to which current mining regime reform processes in Africa can transform the asymmetrical power relations that have typified mining activities on the continent in the past" (p. 199).*

Free mining refers to the mining regimes that were established in the European colonial conquests, including Zimbabwe. Laforce et al,[41] maintain that free mining '*privileges the values and interests of mining companies in contrast to those of Aboriginal groups*', and that it was primarily designed to attract European settlers to expropriate the land and minerals and to neutralise the indigenous populations in the Americas, Africa, Oceania and elsewhere. The mineral regimes of Canada and Australia are modern equivalents of free-mining regimes, which are unsurprisingly strongly favoured by the mining transnational corporations and the World Bank. Zimbabwe's mining laws contain many elements of a free-mining regime, particularly the first-come-first-assessed (FIFA) principle, which dispenses the people's mineral assets gratis, rather than seeking price discovery and the maximisation of the developmental impacts. Fundamentally, according to Lapointe, '*The free-mining system limits the authority and discretionary powers of governments, and as such, governments' abilities to discharge some of their responsibilities.*'[42]

A Zimbabwean resource-based development strategy should rather seek to establish a mineral regime that competitively and transparently concessions all 'known' mineral assets as time-limited leases to achieve the optimal resource rents and economic linkages. Price discovery could include both bidding up fiscal criteria (tax rates, such as resource rent taxes) and developmental criteria (industrial linkages, infrastructure and technology development).

The wholesale handing out of Zimbabwe's mineral assets since liberation has probably cost the country hundreds of thousands jobs, including those that could have been catalysed in other sectors, particularly in up- and downstream investments. In general, mineral investors will tend to have a much better idea of the value of the state's mineral assets than the state itself, and competitive auctioning (concessions) would be an effective method of achieving fair value and developmental goals, through testing the market's appetite for establishing industrial linkages. However, where there is little or no geo-data, an auction is unlikely to flush out fair value and these terrains should first be thoroughly surveyed by the state (geo-survey departments or sub-contractors) before auctioning via a time-limited mining concession (lease) or opened up for private exploration (where the asset is considered to be non-actionable).

Accordingly, following best practice in the oil and gas sector, Zimbabwe should demarcate its territory into areas of unknown mineral assets (high risk), areas of low risk over known mineralised terrains (low risk) and areas of partly known deposits. The first (high risk) would be open to private exploration (current FIFA system), the second (known assets) would be auctioned off as blocks with the state tax-take (resource rent share) as the main evaluation criteria (price

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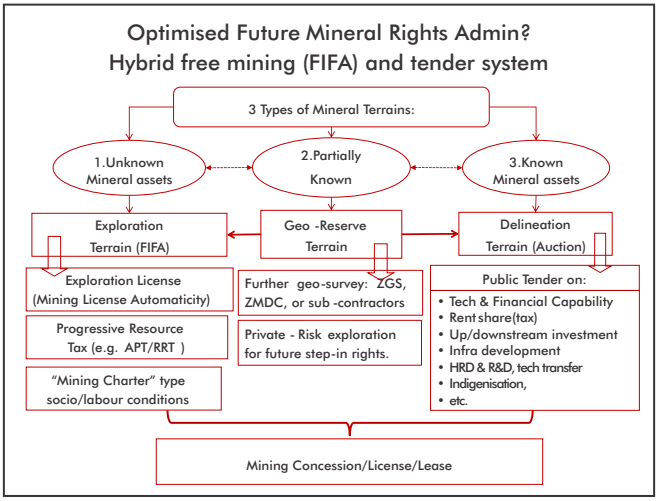
[39]Barton, B.J. (1993) *Canadian Law of Mining* (Canadian Institute of Resources Law, Calgary).
[40]Campbell, B. (2010) 'Revisiting the Reform Process of African Mining Regimes' in *Canadian Journal of Development Studies* Vol. 30, Nos. 1–2, pp. 197–217.
[41]Laforce, M., Lapointe, U. and Lebuis, V. (2009) 'Mining Sector Regulation in Quebec and Canada: Is a Redefinition of Asymmetrical Relations Possible?' in *Studies in Political Economy* Vol. 84, Fall, pp. 47–78.
[42]Lapointe, U. (2009) 'Origins of Mining Regimes in Canada and the Legacy of the Free Mining System'. Conference on 'Rethinking Extractive Industry: Regulation, Dispossession, and Emerging Claims', Centre for Research on Latin America and the Caribbean (CERLAC) and the Extractive Industries Research Group (EIRG), York University, Toronto

discovery) in order to flush out the optimal net present value over the life of the concession for the state, as well as developmental criteria such as jobs, infrastructure, linkages and local capital participation ("indigenisation"). The third category (partly known occurrences) could be reserved for further geo-survey by the ZGS and ZMDC, or explored in partnership with private capital.

Figure 21: Zimbabwe- Possible mineral rights licensing regime.



Source: Adapted from Jourdan, 2011[43]

With increased investment in resource mapping and geodata acquisition, areas would be reclassified from high risk to low risk. Unfortunately, the most geologically prospective parts of the country have already been concessioned, usually with no attempt at price discovery or the maximisation of their industrial development potential. Almost all new Zimbabwean mines, excluding diamonds, that opened since liberation were not "discovered", but were based on known assets, particularly old mines or workings and old exploration targets.

Known and unencumbered mineral terrains could be prepared for public tender by the geological survey department (the GTK in Finland develops mineral targets for tender)[44] or transferred to a state minerals development vehicle (ZMDC?) and prepared for competitive concessions. However, oversight of the auctioning process might be best undertaken by an adequately resourced dedicated resources concessions and compliance commission under the national treasury (Ministry of Finance), which could also oversee other competitive concessions (such as PPPs[45] for infrastructure development) and carry out on-going monitoring and evaluation of the concession conditions (including industrial commitments). An example of a bid scoring matrix, for the public tender of known deposits, that attempts to maximise the mineral linkages, is presented in Table 14.

[39]Jourdan 2011, "Africa's Mineral Resources: What Must be Done to Make Them Drivers of Development" in "Advocates for Change: How to Overcome Africa's Challenges" Ed. Moeletsi Mbeki, Pan Macmillan SA, 2011.
[44]Mining Journal Supplement, Feb 2009, "Finland"
[45]PPP: Private-Public-Partnership

Table 14: Example of a mineral concession bid evaluation matrix

Element	Mechanism	Scoring (example: Σ100%)
Fiscal: Tax Rate (e.g. RRT)	Bid up from base tax rate	Top bid 35, bottom 0, pro -rata in - between
Spatial: Extra infra structure	% extra capacity times the base -need capex for power, transport, water = Σextra$	Top bid 15, bottom 0, pro -rata in - between
Downstream investments	% extra VA above base product (ore, conc) exports @ 5y, 10y, 15y = Σ%VA	Top bid 20, bottom 0, pro -rata in - between
Upstream investments	% local VA purchases @ 5y, 10y, 15y = Σ%VA	Top bid 20, bottom 0, pro -rata in - between
Knowledge formation targets	Bid up local HRD/R&D spend from 5% of pay -roll/an	Top bid 10, bottom 0, pro -rata in - between
Total		100%
∑: sum of; RRT: Resource Rent Tax; VA: value added; HRD: Human Resources Development; R&D: Research & Development		

Source: adapted from Jourdan et al, 2012

Zimbabwe's mineral lease system is based on the staking of a claim (FIFA system) and has its origins in the system adopted by the BSAC when it conquered the country and is fairly typical of the colonial mineral regimes put in place by European colonialists in the 19th Century all over the euro-imperial world (but not in Europe itself!). However, unlike most of the other FIFA colonial regimes, a mineral right (claim/block) in Zimbabwe is not time-limited and can be held in perpetuity, provided that retention fees are paid or minimum work is carried out annually.

The current system (see Figure 22) is sub-optimal and includes the following flaws:

- it allows known deposits to be claimed (FIFA) with no attempt to a competitive price discovery;
- it confers infinite exploitation rights (if fees are paid or work is done);
- it sterilises ground by immediately reserving exploration areas (through Exclusive Prospecting Orders, or EPOs) whilst they await approval. This has apparently sterilised almost all of the nation's prospective acreage

There are wide ranging amendments to the Act in the pipeline (Figure 22) that clean up most of the obsolete sections and detailed modalities that should come under separately promulgated Regulations. However, it only corrects one of the above flaws (#2: Infinite mining rights), and then only for larger mines (not for ASM). The other two major flaws (FIFA rights for known state assets and immediate reservation of prospecting ground) are perpetuated.

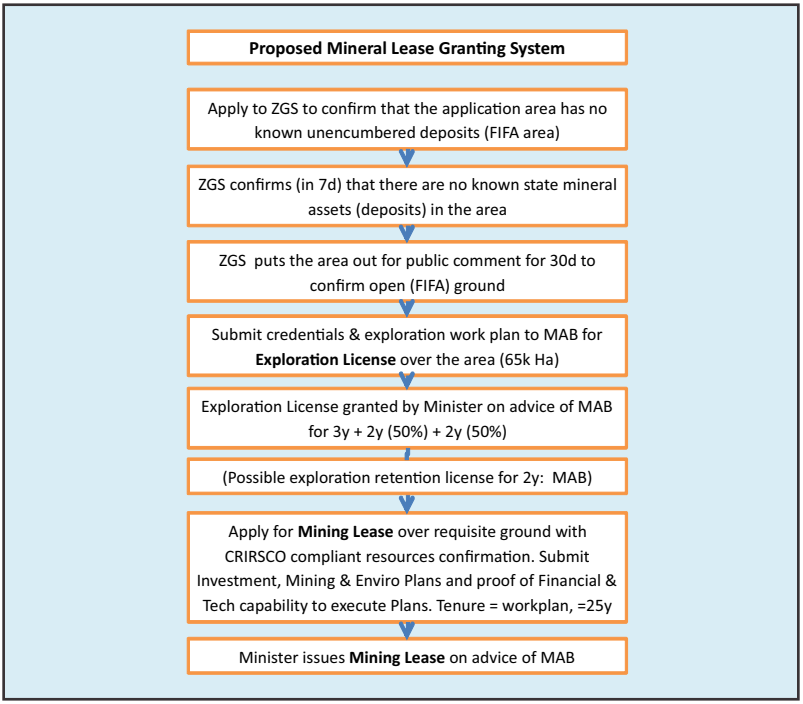
Figure 22: Mineral Rights Administration

3.1.1 SUGGESTED FUTURE MINERAL RIGHTS ADMINISTRATION SYSTEM

Given the drawbacks in the current Act and in the proposed amendments, consideration should be given to developing a new state-of-the-art Minerals Act (clean sheet) that administers the nation's mineral assets in order to maximise the developmental impact of their exploitation. Such a new "clean sheet" Act would have to also include comprehensive transitioning arrangements that give security of tenure to current mining rights holders.

Such an new Minerals Act should only permit open exploration over areas where the Geological Survey (ZGS) has declared that there are no known exploitable resources and be put out for public comment for at least 30 days before being granted (in case there are exploitable resources in the area that the ZGS are unaware of). This process would be greatly facilitated if the ZGS was resourced to immediately undertake a study to categorise the whole of Zimbabwe into areas of known mineral resources (biddable areas), areas of unknown resources (non-biddable = FIFA areas) and areas of partly known resources (reserved for further work by ZGS, ZMDC or state sub-contractors). This would be greatly facilitated by the introduction of a modern Mineral Cadastre System (MCIMS: Mineral Cadastre Information Management System).

Figure 23: Suggested future Exploration and Mining Rights Granting System



A suggested mineral rights issuance procedure, for stakeholder discussion, is presented in Figure 23. It is suggested that an exploration license be given covering up to 65000Ha for 3 years followed by a possible extension by the Mining Affairs Board (MAB) -- dependent on original work-plan compliance – for a further 2 years over half the area, and a further extension of 2 years over half the remaining area (25% of the original area). New work-plans would have to be approved by the MAB for each extension. If economic conditions justify a postponement of mining, an Exploration Extension License could be granted by the MAB for up to 2 years, if the weighted value (price) of the basket of minerals to be produced (as per the mining plan) falls more than 30% below the average value of the basket for the previous 36 months. Accordingly, the remaining (25%) exploration ground could be encumbered (sterilised) for a maximum of 9 years (3+2+2+2).

An Exploration License would be transferable with the authorisation of the MAB, but should attract a 50% Capital Gains Tax (CGT) on the difference between sale price and all legitimate exploration expenditures undertaken to date of transfer, to discourage mineral property speculators ("flippers") and to share in the capital gains on a state asset. A change in the holding company's ownership exceeding 50% should be considered a transfer of the License and accordingly require MAB approval.

A Mining Lease would be issued against a CRIRSCO[46] compliant resources confirmation, a bankable investment/mining plan and a compliant environmental plan, by the Minister on advice from the MAB. The tenure would be as per the mining plan (based on the confirmed resources) for up to 25 years. Discovery of further confirmed resources could permit a lease extension against a new mining plan approved by the MAB.

3.1.2 ARTISANAL AND SMALL-SCALE MINING (ASM)

ASM should have its own less onerous regime to encourage indigenous entrepreneurs and should accordingly be restricted to Zimbabwean citizens. There are numerous definitions of ASM using, inter alia, volume of ore or mineral/metal production, value of sales, size of concession, degree of mechanisation or capital employed, number of workers, depth of operations, etc. It is proposed here that a combination of the volume of ore treated and the size of the concession be used in combination to qualify for ASM rights.

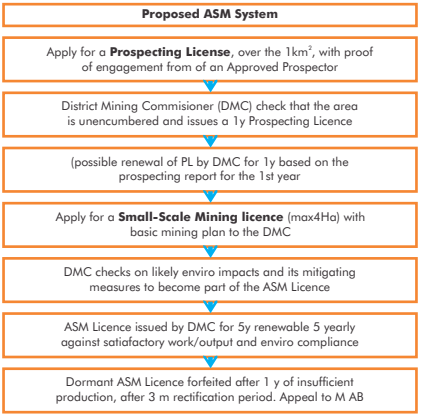
Table 15: Different criteria used in the definition of small-scale mining

Country/Organisation	Criteria
Cote d'Ivoire	Level of mechanisation
Ethiopia	Annual production, Level of mechanisation
Ghana	Capital investment, number of participants
Guinea	Type of mineral exploited
Senegal	Depth of working, crude production levels
South Africa	Capital investment
Tanzania	Capital investment, labour and technology requirements
United Nations	Annual production capacity
Zambia	Size of concession
Zimbabwe	Size of concession, capital investment

Source: UNECA, 2002[47]

A reasonable figure for the volume of ore treated would appear to be around 15kt/month (180,000t/an) and a mining right of up to 40,000m2 (4Ha). A small scale prospecting right could remain as is in the recommended amendments to the Act, namely 1km2. An ASM mining license should be convertible to a Mining Lease, if all the requisite conditions are fulfilled.

Figure 24: Suggested future ASM Prospecting & Mining Rights Granting System



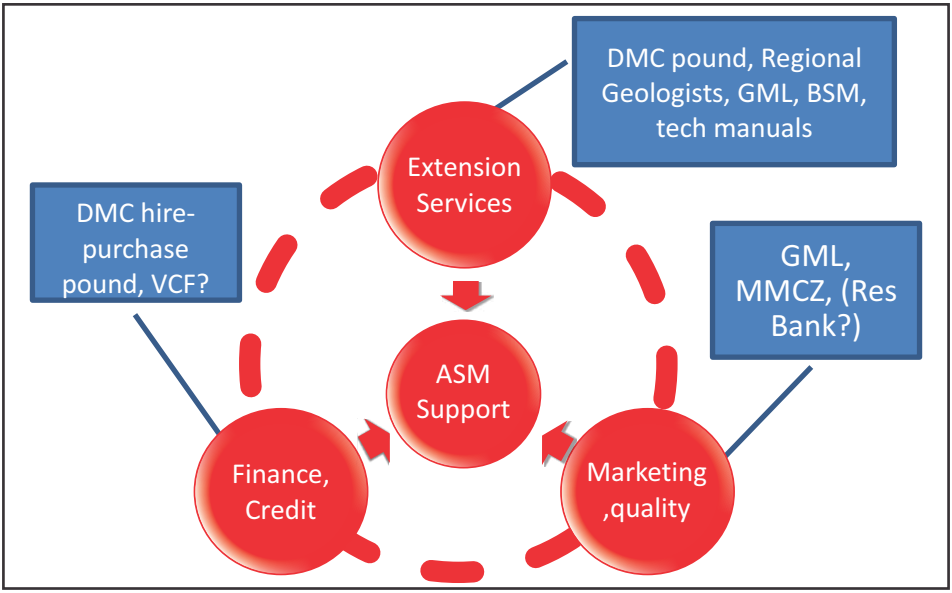
[46]CRIRSCO: Committee for Mineral Reserves International Reporting Standards (e.g. SAMREC, JORC)
[47]UNECA "Small-Scale Mining in Africa", Addis Ababa, 2002, www.uneca.org

A suggested ASM mineral rights administration system is presented in Figure 24 for stakeholder review and discussion. Given that a MCIMS[48] is still not in place, it would be prudent to ensure that the modalities of acquiring and maintaining an ASM prospecting and mining license are prescribed in the regulations rather than the Act.

Although an ASM license needs to be as simple as possible, so as not to create onerous entry barriers to ordinary Zimbabweans, ASM has the potential to create severe environmental damage. In this regard the concept of creating proclaimed ASM zones might be worth considering. The state could carry out a Strategic Environmental Assessment (SEA) over such zones and build the necessary mitigation and remediation measures into the ASM licenses granted in the zone. Failure to comply with the measures would lead to a forfeiture of the license after a reasonable rectification period (3 months?) and appeal procedure (MAB). The state would further carry out periodic environmental assessments over such proclaimed ASM zones and update the requisite conditions in all ASM License renewals in the zone.

The pre-existing ASM support system of extension services (DMC,[49] regional geologist, GML), finance (DMC[50] equipment hire-purchase pound), and marketing/quality (GML and MMCZ) needs to be rebuilt and reinforced. Consideration could also be given to creating an ASM Venture Capital Fund (VCF) as a PPP between the state and the Chamber of Mines (and donors, e.g. CASM grants[51]). These three components – extension services, financing, and marketing/quality assistance – constitute the institutional "Golden Triangle" for successful ASM development (Figure 25).

Figure 25: The ASM Support "Golden Triangle"



DMC: District Mining Commissioner; GML: Government Metallurgical Laboratory; VCF: Venture Capital Fund
In addition, the Government Roasting Plant (GRP: Kwekwe) used to treat refractory gold ores for ASM

Given the historical role of women in ASM, support systems to facilitate the entry of female entrepreneurs into this sector should be configured, such as a special window in the ASM VCF and targeted short training courses under the Bulawayo School of Mines.

3.1.3 TRANSITIONING ARRANGEMENTS

The new Act would have to have a section on transitioning from current rights to the new rights whereby new licences/leases compliant with the new Act (prospecting/exploration licences) would automatically be granted to all mineral rights holders under the old Act. For example, all holders of unworked claims could elect to be issued with either a new Prospecting or Exploration License and all holders of operational claims could elect to convert to either a new ASM License or a Mining Lease. Current holders of SMLs would convert to the new Mining Lease. Current EPO holders could likewise elect to be issued with either a new Prospecting or Exploration License.

[48]MCIMS: Mineral Cadastre Information Management System
[49]DMC: District Mining Commissioner.
[50]GML: Government Metallurgical Laboratory
[51]World Bank "Communities and Small-scale Mining" grant system http://go.worldbank.org/6OCES521R0

3.1.4 MCIMS: Mineral Cadastre Information Management System

The proposed hybrid FIFA-Tender system would be greatly facilitated by the establishment of a modern functional MCIMS, as would the attraction of investors into to Zimbabwean minerals sector. Some work was apparently done in this regard by the Canadian government about 10 years ago. More recently the World Bank funded a "Diagnostic Study on Modernisation of the Mineral Licensing System in Zimbabwe"[52] which concluded that a "...deep and systematic revision of the mining law is required, and the proposed amendments should be supplemented by new Licensing Regulations, including transitional measures for the adaptation of the existing licenses to the new licensing methodology".[53] The study proposed a budget of $1.2 million to implement the MCIMS. However, the proposal that there be a conversion to a grid based system could add significantly to legal/administrative challenges (to convert all existing rights to a grid system and deal with resulting overlaps etc.). Given the availability of low cost and accurate GPS[54] instruments, a system based on polygons that preserved the current shapes may be a better option. In addition, the $150k budgeted for Geodetic network review, is not absolutely essential. Consequently it is recommended that a competent MCIMS consultant be engaged to rapidly review the study and prepare a Terms of Reference, with a reduced scope, for a tender to establish a functioning MCIMS at the ZGS.

A basic system could cost about half of the projected budget (i.e. around $600k). Given the importance of establishing a functional MCIMS, to deal both with the backlog and future mineral rights administration, priority should be given to securing the requisite funding from the Fiscus (Ministry of Finance) as well as from donors and the Chamber of Mines. Both the state and the private sector would benefit immensely from a functioning MCIMS.

3.1.5 SUMMARY OF MINERALS MANAGEMENT PROPOSALS

1. Streamline (simplify) the Mines and Minerals Act (MMA) to cater for exploration licenses and ASM prospecting licences, ASM leases and Mining Leases on a use-it-lose-it principle. Shift the detailed procedures and modalities to attendant MMA Regulations;
2. Amend the MMA to cater for a hybrid FIFA (claims) and public tender system ("known" and "unknown" mineral resource terrains);
3. Amend MMA to cover back/forward linkages VA (%) milestones (e.g. at 5, 10, 15, 20y) and corporate minimum spending on knowledge formation (HRD/R&D) of at least 5% of payroll;
4. Build a mineral deposit public tender (auction) capacity in the Ministry of Mines and ZMDC;
5. Urgently locate funds to establish a functional national mineral cadastre (MCIMS);
6. Rebuild the "golden triangle"for supporting ASM (finance, marketing and technical support);
7. Establish an ASM venture capital fund with COMZ, donors, et al.;
8. Reconfigure the Zimbabwe Geological Survey (ZGS) as a state agency with the ability to re-attract requisite professionals;
9. Resource ZGS to recommence systematic geo-mapping and to categorise the country into known, unknown and partly known mineral resource zones; and
10. Capacitate ZMDC/ZGS to develop mineral targets for public tender.

3.2 THE CURRENT CRISIS AND THE UNDERLYING COMMODITIES BOOM

Any strategy utilising a resource endowment clearly requires a degree of comfort that resources demand will be sustained and that prices will not suddenly collapse as happened in the 1980s and 1990s and in the second half of 2008.

From 2002 to 2008, many developing countries displayed strong growth after several decades of stagnation due to the recent commodities boom, which was provoked by robust demand from China and, to a lesser extent, other emerging economies such as India and Vietnam. Many developing countries have significant potential for commodities production, especially minerals, and consequently foreign direct investment (FDI) into the majority world has, according to the UNCTAD World Investment Report (WIR), displayed a marked upturn since 2002/3, mainly into the mineral resources and telecommunications sectors. The commodities boom faltered during the second half of 2008 due to the global recession caused by the US sub-prime debt crisis, but most commodity prices have recovered to 2007/8 the levels and foreign direct investment is reviving.

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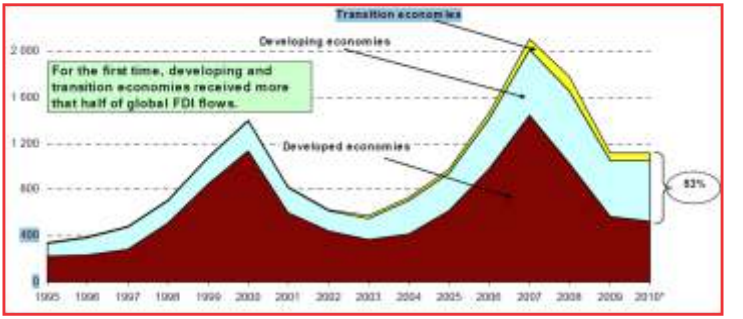
[52]Enrique Ortega Girones, "Diagnostic Study on Modernisation of the Mineral Licensing System in Zimbabwe", World Bank, 2010
[53]Op cit, p 7
[54]GPS: Global Positioning System

Figure 26: FDI inflows, global and by group of economies, 1995-2010 (Billions of dollars)



Source: UNCTAD, 2011[55]

Figure 27: Indices of primary commodity prices.

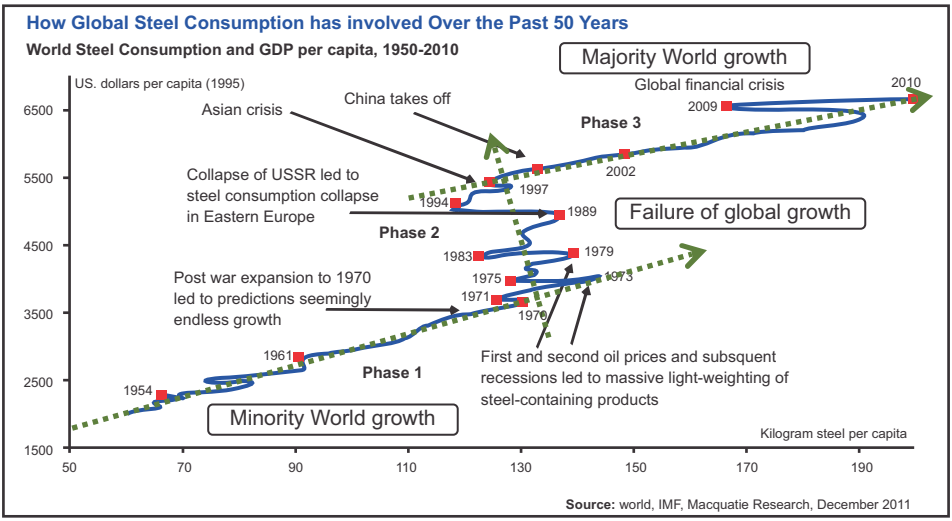
Source: http://www.indexmundi.com/commodities/

Nevertheless, the two seminal questions remain: when will the current global US toxic assets and Euro debt recession abate; and how long will the underlying demand last? Or will it peter out like so many earlier commodity booms?

The underlying driver of mineral demand is the metals intensity of global gross domestic product (GDP) growth. Figure 28 displays the global steel intensity, which is a good proxy for metals intensity, per world real GDP.

[55]http://unctad.org/en/docs/webdiaeia20111_en.pdf

Figure 28: Global Minerals Intensity of GDP (steel as proxy)



Source: Adapted from http://advisoranalyst.com

3.2.1 PHASES OF GLOBAL STEEL INTENSITY OF GDP

The global steel intensity of GDP shows three distinct phases since the Second World War:

Phase 1 (1950 to ~1970): high steel intensity – Post-Second World War minority world (first world) reconstruction and increasing buying power within the minority world, resulting in strong minerals demand and prices and widespread move to greater state control (nationalisation) of resources. Negligible impact on industrialization in the majority world (third world).

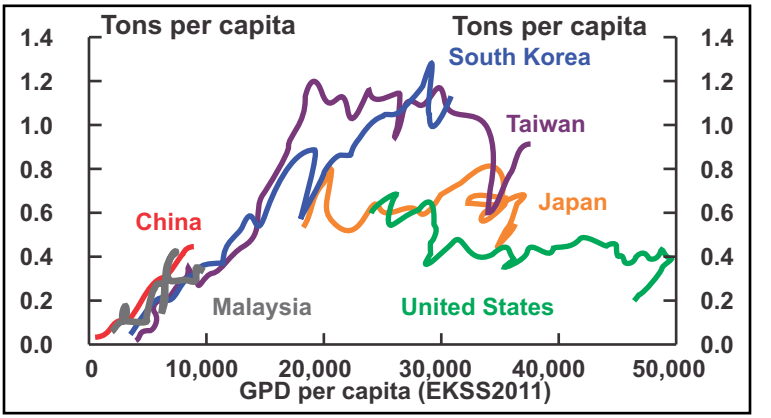
Phase 2 (1970 to 2000): low steel intensity – minority world infrastructure installed, move to services (only Asian tigers in high-intensity phase, but too small to impact on global trend). This resulted in over-supply and low prices for most minerals. Stagnation and political instability in resource exporting states (majority world). Widespread privatization of resources and return to colonial "free mining" regimes, often dictated by Bretton Woods Institutions (SAPs) under minority world "Washington Consensus" ideology. This growth gap reflected a failure of continuous global growth due mainly to minority world hegemony over international trade regimes and widespread use of subsidies.

Phase 3 (2000 to present): High steel intensity (higher than Phase 1) as the majority world takes off (Brazil, Russia, India, China – BRIC countries) and trade rules are increasingly revised, reflecting a partial loss of minority world hegemony over global trade systems. Period of high demand and prices and a return of "resources nationalism", but temporarily stalled due to the extraneous US toxic debt Euro-zone crises, but by 2010 demand was already showing signs of recovery through stimulus packages and by 2011 most commodity prices had regained pre-crisis levels.

Global metal intensity would have been on a continuously increasing trend if global growth had been diffused to more of the world's people in the 1980s and 1990s. Instead, diffusion was only to the Asian tigers with a population of less than 80 million, resulting in only a minor impact on global minerals demand. The diffusion of global growth (and intensity) finally only occurred twenty years later (in BRICs), but it was temporarily stalled due to the US toxic debt crisis plunging the world into recession. However, demand appears to be recovering despite the Eurozone debt crisis.

As is apparent from Phase 1 of intensity, sustained by minority world growth, steel intensity for any one country tends to fall off once the basic national infrastructure is in place and most domestic markets have been developed and penetrated. Growth from then on is mainly in services accompanied by a falling proportion of employment in manufacturing, as evidenced by almost all mature minority world economies.

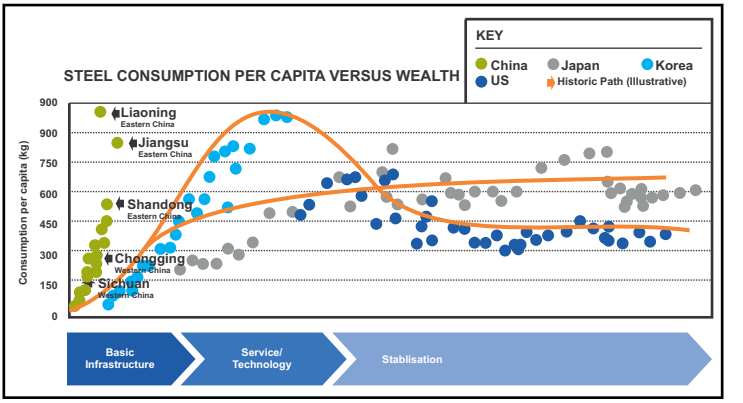
Figure 29: Steel intensity per capita.



Source: Australian Treasury, 2012[56]

The country steel intensity per capita data appears to indicate that, at around $16k-$20k/capita, the metals intensity of GDP growth falls off, no matter when the initial metals consuming 'lift-off' phase occurred. Given that China is only at about one-third up this high-intensity phase, that India is at about a third that of China and given that they have a combined population approaching three times that of the minority world, it would then appear that the current global high metals intensity phase might continue at least as long as Phase 1 (see Figure 28) or roughly 30 years (1950 to 1980). This assumption excludes growing intensity from other emerging economies, such as Brazil, Vietnam and Indonesia, which if included could make this a 30–50 year high-intensity phase.

Figure 30: Steel Consumption per Capita versus Wealth



Source: Cliffs Natural Resources Inc, 2012

In concluding this section, it appears that, despite the recent commodities slump, the underlying boom could be an unprecedented long 'super-cycle', provided that China and India keep up their robust economic growth. This then leaves us with the fundamental question of how can the current commodities-stimulated high prices be transformed into sustainable growth, industrialisation and development in Zimbabwe?

[56] http://treasury.gov.au/PublicationsAndMedia/Publications/2012/Economic-Roundup-Issue-1/Report/global-commodity-markets

3.2.2 A RESOURCE-BASED STRATEGY & THE "RESOURCE CURSE"

The "resource curse" is a much debated and studied phenomenon, but it is clear that a resource endowment is not always a curse and, if well-managed, can be a "blessing" as evidenced by strong sustained growth in several resource economies (or erstwhile resource economies), such as Sweden, the USA, Norway, Malaysia, Finland, Australia, Canada, New Zealand (Aetoroa), Botswana, etc. A comprehensive paper (Van der Ploeg, 2007,)[57,58] adequately surveys the literature in this regard and Collier & Goderis' (Collier & Goderis, 2007)[59] extensive and illuminating analysis of a large sample of countries (130), using a "panel cointegration methodology" refines the impact of the "resource curse" with the following findings:

Empirical evidence suggests that commodity booms have positive short-term impacts on growth, but negative long-term impacts on developing countries;

These adverse long-term impacts are only experienced by exporters of "high rent" mineral (non-agricultural) commodities;

The key determinant as to whether a mineral boom will be a "blessing" or a curse" appears to be the level of governance, particularly the existence of "sufficiently good institutions" (Collier & Goderis, 2007);

The main "channels" of the curse are:

- High public and private consumption;
- Low/inefficient investment;
- Overvalued (strong) currency ("Dutch Disease").

However, what is significant is that all of these "channels" can be neutralised or ameliorated through appropriate policies & strategies and the resource "curse" can be turned into a "blessing" through targeted deployment of the resource rents and opportunities. In this regard Omano Edigheji also notes that "*...what sets developmental states apart from mineral-rich countries is primarily the nature of institutions and consequently state capacity...*",[60] which is consistent with Colliers & Goderis' findings. A common method of ameliorating the three "channels" is to capture the resource rents and to keep them offshore in a Sovereign Wealth Fund (SWF). The SWF could be used to fund *long-term* physical and human (knowledge) infrastructure projects (i.e. "drip-feed" back into the economy) to enhance future economic competitiveness, in the interest of inter-generational equity. This paper explores some strategies, particularly for Zimbabwe, to overcome or dilute elements of the "resource curse" and to build appropriate institutions.

3.3 ZIMBABWE: TOWARDS A SUSTAINABLE RESOURCE-BASED DEVELOPMENT STRATEGY

Zimbabwe's rich and diverse resource base, combined with the strong global resources demand, could underpin a viable resource-based re-industrialisation and industrialisation strategy that goes beyond supplying raw materials to the world economy. This could be achieved by utilising its extensive resource developmental opportunities to establish the requisite economic infrastructure across the country and into the region (particularly access to the coast) and to create the crucial resource sector linkages into the local, regional and sub-continental economies.

This 'deepening' of the resources sector though up-, down- and side-stream (infrastructure) industrial linkages could form core industrialisation nuclei for the economy and could, over time, diversify with increasing human resource development, technology development and skills formation, through the lateral migration of these resource-dependent industrial clusters into resource-independent industrial activities.

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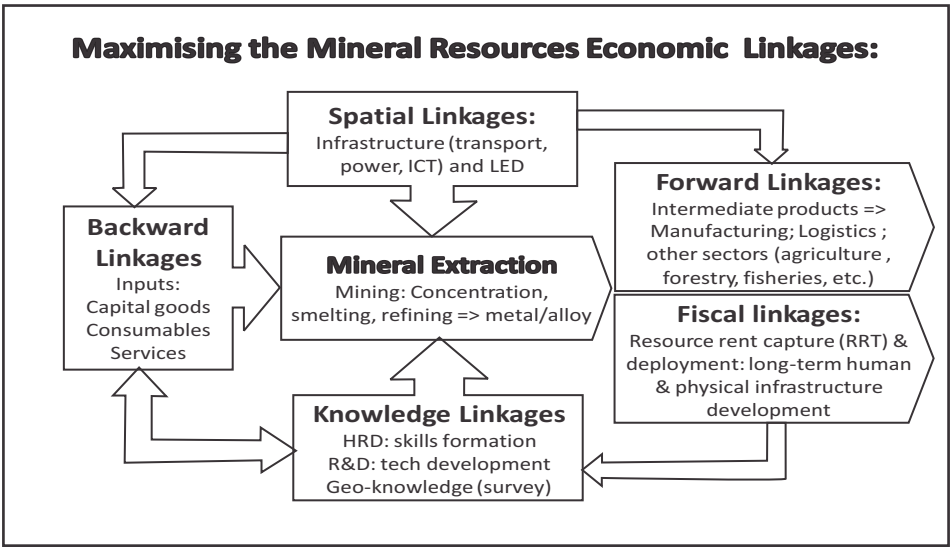
[57]"Challenges And Opportunities For Resource Rich Economies", Frederick van der Ploeg, European University Institute, Florence, Oxcarre, Oxford University, University of Amsterdam, Revised 31 May 2007

[58]"Can the Natural Resource Curse Be Turned Into a Blessing? The Role of Trade Policies and Institutions", Rabah Arezki and Frederick van der Ploeg , CEPR Discussion Paper No 6225, 2007

[59]"Commodity Prices, Growth, and the Natural Resource Curse: Reconciling a Conundrum", Paul Collier and Benedikt Goderis, University of Oxford, August, 2007

[60]Edigheji, Omano, op cit, p12.

Figure 31: Establishing the Seminal Resource Linkages



Source: Jourdan, 2012

In addition to the capture and judicious deployment of resource rents, Zimbabwe's mineral resources endowment gives it a comparative advantage in establishing resource linkage industrial clusters through the following:

1) The immediate market offered by the local and regional resource industries' demand for inputs such as plant, equipment, machinery, consumables and services. This market can be relatively large for specialised resource industries' demand, ameliorating economies of scale constraints (for example, the region constitutes three-quarters of the global platinum group metals mining and processing inputs market);

2) A potential technological advantage through close proximity to the resource industries' demand for innovation, adaptation and problem solving (these activities often currently take place offshore in the minority world);

3) A feedstock price advantage for downstream resource processing industries, particularly mineral processing (smelting, refining, alloying and fabrication); and

4) Opportunities to develop the supplier industries for the extensive resource infrastructure requirements.

Table 16: local resource and infrastructure markets

Resource and resource-based inputs markets
Mineral Exploration (equipment & services)
Mining (capital goods, consumables, services)
Concentration (equipment, machinery, grinding media, etc)
Smelting (capital goods, consumables, services)
Refining (equipment, machinery, chemicals, etc)
Resource infrastructure inputs markets
Construction (cement, ceramics, steel, fittings)
Railways (rail, locos, rolling-stock and spares)
Highways, roads (vehicles and trailers)
Ports and airports (capital goods)
Pipelines (gas, fuels and slurries)
Power plants and transmission infrastructure
Water (treatment, pumping, storage and transport)
Telecommunications (transmission)
Knowledge infrastructure (universities and R&D institutions)

Source: adapted from Jourdan, 2008

3.4 RESOURCE LINKAGES INDUSTRIAL CLUSTERS

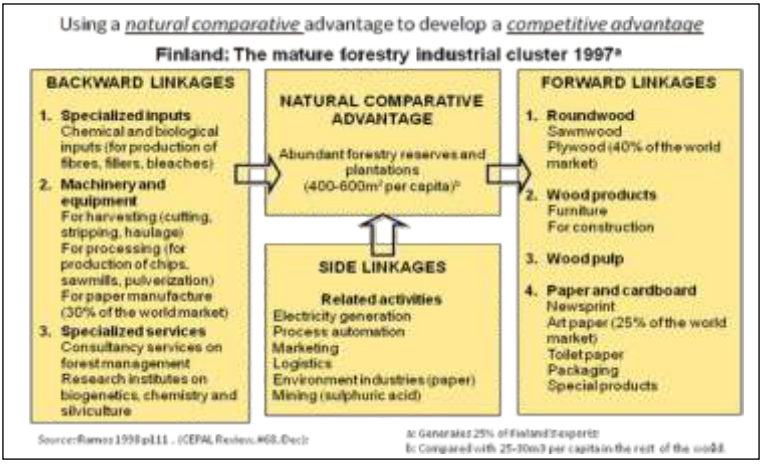
The development of these resource sector linkages slowly builds integrated resource-linked industrial clusters where the different components reinforce one another and, from initially serving local demand, develop competencies to export goods and services to resource sectors in the region and ultimately globally.

Resource-linked industrial clusters are indirectly anchored on the comparative advantage of the resources sectors and are comprised of:

- Upstream linkage industries: plant, machinery, consumables (inputs), engineering services, financial services, consultancies;
- Downstream linkage industries: resources processing (value addition) into intermediate products, semi-manufactures, components, sub-assemblies and finished, resource-intensive products. Resource processing usually also produces co-products and by-products, which also constitute potential feedstocks for further downstream linkage industries. These resource beneficiation industries in turn create markets for further upstream industries (capital goods, consumables and services);
- Sidestream linkages: Power generation and supply, construction, process automation, logistics, marketing, transport infrastructure (rail, road and ports), environmental industries, human resource development and skilling entities and other resource sectors that supply inputs into the resource sector (for example, mineral inputs such as fertiliser and conditioners into agriculture, and chemicals into mining). These in turn create new demand for upstream industries.

These linkages are illustrated for the Finnish forestry cluster in Figure 32 below, but similar sector clusters can be developed for Zimbabwe's mineral resources natural comparative advantages.

Figure 32: Finland's forestry cluster.



Source: Adapted from Ramos, 1998

According to economist Joseph Ramos (1998), the evolution of the resource linkage industrial clusters generally goes through the following four phases (p. 112):

Phasing of Resource-based Industrial Clusters

PHASE I: Resource extraction with minimum essential local processing (for example, ore concentration, raw cacao beans, roundwood and cotton lint). Almost all the inputs (capital goods, consumables and engineering services) are imported (except for production engineering services) in this phase;

PHASE II: Resource processing and export (for example, wood pulp, agri-processing, mineral smelting and refining) as well as initial import substitution of the lower-technology imported inputs (usually under licence for the local market) and increasing production engineering services;

PHASE III: Initial export of some goods and services established under import substitution in Phase II. The engineering services are increasingly based on local intellectual property and the resources are processed into higher value-added products (for example, fine and special papers, metal alloys, semi-manufactures, packaged agricultural products and textiles);

PHASE IV: Exports of a wide range of resource goods and services of increasing complexity and technology including design engineering services, resource plant and machinery (predominantly based on local intellectual property). Exports of resource-based products of greater variety and complexity and the migration of knowledge-intensive resource services industries, into new, resource-independent sectors.

These phases of resource industrial cluster development are in reality more diverse and complex with some activities moving faster and others slower, but overall there is an increase in product complexity and sophistication (both up- and downstream) that needs to be paralleled with the increasing production of high-level skills (engineers and scientists) and investments into research and development (R&D).

Ultimately, a natural *comparative* advantage (Phase I) has been transformed into a *competitive* advantage (Phase IV) with continuous incremental improvements in productivity and design, and the basis has been laid for the migration of hi-tech industries into new, resource-independent (either as a feedstock or market) sectors and generic diversified industrialisation.

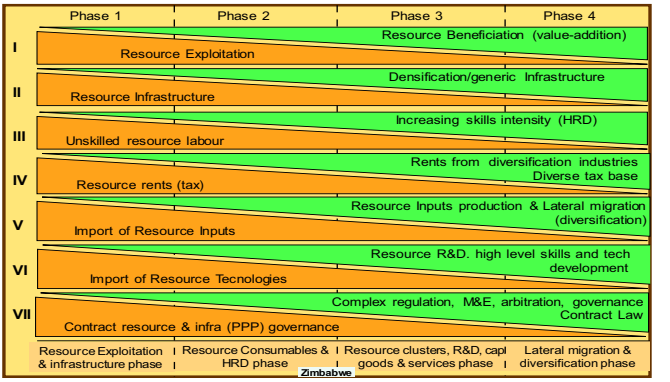
Work by Maloney (2007) and the ANC (2012) indicates that the failure of resource-based industrialisation is generally due to a lack technological adoption (backward linkages) because of a *"deficient national learning or innovative capacity, arising from low investment in human capital and scientific infrastructure"*.[61] The ANC (2012) SIMS study concluded that there appeared to be no resource-based industrialisation success story that had not succeeded in dramatically raising their technical human resource development (HRD) capacity for engineers and scientists and their technology development capacity (R&D), both of which are a pre-requisite for fully exploiting the resources backward and forward industrial linkages.

There have been several similar linkages studies done for the minerals sector in both South America and southern Africa. A recent study of the South African platinum group metals sector (Lydall 2009) noted that the engineering, procurement, construction management (EPCM) firms are critical to optimising the initial linkages, which also impact on the potential ongoing linkages in terms of the technologies and processes selected. In addition, the Mozal (BHPB) linkages programme in Mozambique has indicated that the configuration of local sub-contracts is important to the success of developing local suppliers. The failure in SA to develop downstream linkages at the Hillside aluminium smelter (Gencor, later BHPB) in Richards Bay is predominantly due to monopoly pricing of the product at an import parity price (IPP). The stipulation of competitive pricing of all resource products is seminal to any successful forward linkages (downstream) strategy.

Nevertheless, the development of regional resources inputs industrial clusters is also critically constrained by the small Zimbabwean national market. Even the Southern African Customs Union (SACU) market (Africa's largest market) generally lacks the requisite demand for many world-scale viable capital goods plants. The accession of Zimbabwe into the SACU and the establishment of regional (SADC) common markets would greatly increase the possibility of a successful resource-based development strategy. Other resource-based industrialisation success stories either had larger domestic markets (US, Brazil) or had access to larger markets (the Nordics: access USSR and EU).

A schematic phasing of a resource-based development strategy is presented in Figure 33, which displays the decreasing importance of resource exploitation as the resource linkages are developed.

Figure 33: Schematic resource-based industrialisation phasing.



Source: Jourdan, 2008

[61] Maloney 2012

As the linkages are established more value is added through beneficiation than mining (I), resource infrastructure is densified to serve other areas (II), labour becomes increasingly skilled and mining more capital intensive (III), government revenues diversify from resources to other sectors (IV), imported mining inputs are increasingly produced locally (V), mineral technologies are locally developed or adapted rather than imported (VI) and resource exploitation is governed by general laws and institutions rather than project specific contracts (VII).

A Zimbabwe resource-based development strategy would typically go through similar phases of industrialisation, with decreasing importance of its resources comparative advantage and an increasing relative importance of a skills-based competitive advantage.

Almost all African economies can be positioned on this continuum, though most would still be in Phases I or II, while Zimbabwe would probably be positioned somewhere in Phase II (though slipping back). In summary, the key elements of a resource-based development strategy are:

1) The realisation of a resource comparative advantage by overcoming infrastructure constraints through the establishment of infrastructure networks. This has largely been achieved in Zimbabwe (in need of rehabilitation) though major new infrastructure is needed for bulk mineral exports such as iron ore and coal (see .

2) The 'densification' of the resource-based infrastructure through the establishment of ancillary and feeder infrastructure to enlarge the resources corridor catchments and beneficiary sectors (agriculture, forestry and tourism).

3) The deepening of the mineral sector linkages into the domestic and regional economy through beneficiation of these resources and creating supplier and service industries around the minerals sector and developing them into complex resource linkages industrial clusters (up-, side- and downstream industries). However this is critically dependent on:

4) Dramatically increasing the national quality of human capital and technology development through concerted long-term investment in technical HRD (engineers, scientists, technicians) and R&D (innovation);

5) The capture of resource rents through resource rent taxes and the re-investment of resource rents into human resource development, skills and R&D for technology development to capitalise on the resource linkages opportunities, as well as into long-term infrastructure, for the development of mature resource industrial clusters and, ultimately, a competitive advantage, independent of resource endowments.

A comprehensive Zimbabwean resource-based strategy should develop the labour-intensive resources upstream sectors as well as going further downstream, beyond capital-intensive intermediate goods, into labour-intensive fabrication, which is often stunted by the widespread practice of monopoly pricing of intermediate industrial feedstocks.

3.5 OPTIMISING THE RESOURCE LINKAGES

In 2009, the African Union (AU) Heads of State adopted the *"The African Mining Vision"* that contains important strategies for the maximisation of the impact of mineral resources on growth and development. This Vision aims to achieve a "knowledge-driven African mining sector that catalyses and contributes to the broad-based growth & development of, and is fully integrated into, a single African market through:

- Down-stream linkages into mineral beneficiation and manufacturing;
- Up-stream linkages into mining capital goods, consumables & services industries;
- Side-stream linkages into infrastructure (power, logistics; communications, water) and skills & technology development (HRD and R&D);
- Mutually beneficial partnerships between the state, the private sector, civil society, local communities and other stakeholders; and
- A comprehensive knowledge of its mineral endowment".[62]

The Africa Mining Vision correctly emphasises the need for mining to be integrated into the rest of the economy through developing the crucial mineral linkages sectors and investing in geo-survey.

The key element to a strategy that uses natural resources to catalyse growth and development appears to be, from looking at successful resource-based industrialisation, the maximisation of the concomitant opportunities offered by a natural resources endowment, particularly the 'deepening' of the resources sector through optimising economic linkages into the local economy.

[62]African Union 2009: African Mining Vision (AMV), Addis Ababa, February 2009

3.5.1 FISCAL LINKAGES: RESOURCE RENTS

Resource rents (returns in excess of the expected/average return on capital) should be used to improve the basic physical and knowledge infrastructure of the nation. Generally, the resource rents are not shared with the resource owner (the state/people), except, partially, through the Additional Profits Tax (APT) in the Special Mining Leases (SML) and the implementation of a resource rent tax (RRT) should be considered for all mining operations, possibly to be kept offshore to ameliorate currency appreciation and fiscal shocks, and which could be drip-fed back into long-term (ten to twenty year) knowledge and physical infrastructure.

3.5.2 SPATIAL LINKAGES (INFRASTRUCTURE)

The FAO notes that *"Only 21 percent of [Africa's] population live within 100 km of the coast or of a navigable river, against 89 percent in high-income countries. The proportion of the population that is landlocked is seven times higher than in rich countries. Landlocked countries in Africa have average freight costs almost three times higher than in high-income countries".*[63]

Furthermore, over two centuries ago, Adam Smith observed that "There are in Africa none of those great inlets, such as the Baltic and Adriatic seas in Europe, the Mediterranean and Euxine seas in both Europe and Asia, and the gulphs of Arabia, Persia, India, Bengal, and Siam in Asia, to carry maritime commerce into the interior parts of that great continent: and the great rivers of Africa are at too great a distance from one another to give occasion to any considerable inland navigation." [64] Zimbabwe's land-locked location clearly leaves it with a severe logistics constraint in terms of trading in the global markets, which will constrain future growth, unless overcome.

The high-rent resources infrastructure (mainly minerals) could be used to open up other lower rent, resource potential (such as agriculture, forestry and tourism), as per the spatial development initiatives (SDI) methodology in order to access zones of economic potential with lower returns that cannot afford their own requisite infrastructure. All resource concessions must include third party access at non-discriminatory user-tariffs to all the resources infrastructure (transport, power, water and telecommunications), in order to catalyse the higher development impact resource infrastructure 'hitch-hikers' (such as agriculture), which in general have a much higher socio-economic propulsive impact. This condition needs to be configured into all resource contracts (concessions) for all resource infrastructure.

Resource infrastructure generally relies on state assets (servitudes) or rights (licences) and consequently constitutes a potential lever for encouraging the resource and the infrastructure concessionaires to optimise the local mineral and infrastructure linkages.

3.5.3 DOWNSTREAM VALUE ADDITION [FORWARD LINKAGES]

The locational advantage of producing crude resources should be used to establish resource processing industries that could then provide the feedstocks for manufacturing and industrialisation. In this regard, the resource contracts or licences need to provide incentives or disincentives for mineral resources downstream beneficiation. However, the widespread practice of monopoly pricing of beneficiated minerals/metals could negate this advantage for the manufacturing industry (especially steels and polymers). In addition, the first steps of beneficiation are often energy intensive (smelting), which is currently constrained by Zimbabwe's power shortages.

Consideration should be given to much greater intra-regional power trade (through, for example, the regional power pool: SAPP),[65] which could be based on potential low cost and sustainable hydro-power from the Congo, Zambezi and other rivers between the tropics. However, in many cases, African mining companies have encouraged beneficiation offshore. An example would be Anglo American's divestment from its main platinum group metals downstream beneficiator and technology developer, Johnson Matthey Plc in the 1990s (when it was the major shareholder, at more than 40%), after investing heavily in it, especially in technology development, over the previous 40 years. This was probably due to its increasing focus on 'core competence' (mining) in preparation for its exit and London listing. This appears to indicate that the South African decision to allow Anglo to relist abroad was possibly ill-advised and that the 'unfettered' movement abroad of domestic capital should be curtailed.

3.5.4 UPSTREAM VALUE ADDITION [BACKWARD LINKAGES]

The resources sector market should be used to develop the resource supply/inputs sector (for example, capital goods, consumables and services). This often offers a relatively large market for specific inputs for particular resource exploitation. Zimbabwe used to boast a substantial mineral inputs sector which contracted during the currency crisis, but is slowly growing again due to the resuscitation of the mining sector. However, it will need strategic interventions to get back to and surpass its former capacity, especially in attracting back skills that were lost during the crisis.

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[63] FAO "World agriculture: towards 2015/30", p27, ftp://ftp.fao.org/docrep/fao/004/y3557e/y3557e.pdf

[64] Smith, Adam. 1976 [1776]. An Inquiry into the Nature and Causes of the Wealth of Nations. Chicago: University of Chicago Press (Cannan's edition of the Wealth of Nations was originally published in 1904 by Methuen & Co. Ltd. First Edition in 1776). page 21

[65] SAPP: Southern African Power Pool, Headquartered in Harare.

Much of Zimbabwe's mineral capital goods are imported and of the few capital goods companies that it had, several have shut down or contracted over the last decade, in part due to the disinvestment of the old southern African mining houses (e.g. Anglo American and Lonrho), which used to invest in a plethora of up- and downstream industries.

Local content (local value-added) milestones need to be built into the resource contracts or licences. In a Organization for Economic Cooperation and Development (OECD) Development Centre policy brief, Gøril Havro and Javier Santiso[66] point out that both Norway and Chile experienced:

"…direct efforts to diversify their economy and to support industries associated with the natural-resource sector – such as engineering and supply – as well as non-resource sectors. Norwegian policies in the 1970s were markedly interventionist in this regard . . . The legal framework emphasised local content until 1990, to develop the infant petroleum supply industry. Norway also pushed for state participation in the same areas, in spite of reluctance on the part of many of the international companies."

Havro and Santiso further contend that:

"…local-content requirements could potentially have beneficial effects as well, as seen in Norway, since they would contribute to developing domestic economic activity rather than relying on rents, while at the same time increasing human capital through learning-by-doing and technological spillovers. However, there is a need for good co-operation with the foreign companies to ensure that such requirements are not commercially unviable, and at the same time to ensure that they have a real learning impact and are not just seen as another tax payment by companies. Standardised local-content agreements worked out with experts in the field could be useful in achieving this."[67]

The platinum group metals seams of the Bushveld Complex in South Africa and the Great Dyke in Zimbabwe reportedly constitute the world's largest trackless mining opportunity. However, the requisite capital goods will predominantly be supplied by imports, due to the failure to invest in the local development of trackless mining equipment, especially after the demise of the Chamber of Mines Research Organisation (COMRO) in South Africa and the Institute of Mining Research (IMR) in Zimbabwe.

3.5.5 KNOWLEDGE LINKAGES [HUMAN & TECHNOLOGY/PRODUCT DEVELOPMENT]

Resources exploitation technologies generally need to adapt to local conditions (for example, climate, mineralogy and terrain) in order to provide opportunities for the development of niche technological competencies in the resources inputs sector. This sector tends to be knowledge-intensive and accordingly needs 'priming' through investment in human resource development and R&D. However, several studies have shown that it has the capacity to later 'reinvent' itself outside the resources sector to produce new products for other non-resource markets.

Future exploitation contracts or licences need to facilitate the establishment of a domestic resources R&D capacity, and the requisite human resource development. This type of capacity needs to be rebuilt and resourced across the continent, together with the mining and capital goods sectors to ensure that mineral technology opportunities do not leak away to states such as Sweden and Finland, which offer greater R&D incentives and support.

Critical to the development of technologies and products is the development of the requisite human resources with technical skills (engineers, scientists, artisans, technicians) and investing in HRD capacity development institutions (universities, colleges, training centres, etc.). However, these tertiary education institutions need to be fed from the schooling system with adequate graduates with maths and science competency (A-levels). Consequently investments need to be directed at upgrading the maths and science capacities at school level. A proportion of the resource rents garnered by the state could be reserved for investment into dramatically enhancing the production of technical cadres. No resources dependent economy has ever industrialised without concerted investments into technical HRD and R&D.

3.5.6 DEVELOPING THE LINKAGES INDUSTRIES AND CLUSTERS

Zimbabwe should focus on developing its resource linkages firms by applying best practice from more industrialised states that has a similar set of endowments. In this regard Justin Lin (2010)[68] proposes six useful steps for "growth identification and facilitation" of firms and clusters that provide several insightful measures for growing these sectors:

[66]Gøril Havro and Javier Santiso 2008, "To Benefit From Plenty: Lessons From Chile And Norway", OECD Development Centre, Policy Brief No. 37
[67]Havro & Santiso 2008, op cit
[68]Lin, Justin Yifu (2010) "New Structural Economics. A Framework for Rethinking Development", World Bank, WPS 5197

Step 1: Find fast growing countries with a similar endowment structure and with about 100% higher per capita income. Identify dynamically growing tradable industries that have grown well in those countries for the last 20 years.

Step 2: See if some private domestic firms are already in those industries (of which may be existing or nascent). Identify constraints to quality upgrading or further firm entry. Take action to remove constraints.

Step 3: In industries where no domestic firms are currently present, seek FDI from countries examined in step 1, or organize new firm incubation programs.

Step 4: In addition to the industries identified in step 1, the government should also pay attention to spontaneous self-discovery by private enterprises and give support to scale up the successful private innovations in new industries

Step 5: In countries with poor infrastructure and bad business environment, special economic zones or industrial parks may be used to overcome these barriers to firm entry and FDI and encourage industrial clusters.

In Zimbabwe's case some "role models" might be Finland (was a resource-based economy 40 years ago – forestry and minerals – and today is advanced industrial nation) and Brazil (although still resource-based – minerals & agriculture – it is rapidly industrialising). South Africa (slow growing) may be a good example of what not to do – its resource linkages industries and resource knowledge sectors have shrunk over the last 20 years.

The experience of other erstwhile resource economies that are today industrialised strongly indicates that the development of the resources economic linkages sectors was seminal to their success. The principal linkages sectors are discussed in the next sections:

3.6 MINERAL FISCAL LINKAGES

3.6.1 ECONOMICS OF THE MINERAL SECTOR – SPECIAL FEATURES

The "economics" of the minerals sector has many features specific to it which often underpins the rationale for special instruments to capture and manage mineral rents. In general, the sector has:

- Finite assets- ultimately depleted. Left with a "hole in the ground";
- Potential for huge rents and huge disasters;
- Volatility of commodity prices,affecting forex and fiscal inflows:
- Impact on exchange rates (stronger/weaker currency)
- Impact on fiscus (expand then can't contract, increase in debt, finally SAP….)
- Dominated by large TNCs: Increasing ownership concentration;
- Enclave nature of mines and processing facilities (spatial inequalities)
- Generally capital intensive (low job/capex ratio)
- Political desire for greater VA (downstream beneficiation) at any cost;
- Irregular unpredictable 'windfall' profits;
- Diversion of local capital into resource boom sectors;
- Asian demand stimulated mineral "supercycle"?
- Resource nationalism: greater state intervention/participation;
- Rent "diversion" by elites, discouraging development of other sectors;
- Asymmetric contract negotiation capacity between TNC and host states;
- Lack of transparency and accountability on resource contracts (licenses/leases);
- Lack of transparency and accountability on tax proceeds (EITI);
- Environmental degradation and negative impacts on local communities;
- The "Resource Curse" and Dutch Disease;
- Etc…

3.6.2 TAX INSTRUMENTS

A typical and broadly applicable impost which is not unique to mining is the corporate income tax. Here, the rate of tax, allowable deductions from gross income and the extent to which losses are carried forward (or even back) are the typical issues considered. As indicated above, capital allowances are a mechanism by which policy seeks to influence the pattern of expenditure in a project. The treatment of environmental expenses, particularly those for on-going environmental management, disaster mitigation and for funding mine closure requires innovative treatment in fiscal regimes. For example, the creation of environmental funds into which companies contribute has become common in most mining regimes. Whether expenditure on community or social activities should be permitted as a deduction from gross income for the purposes of determining taxable income also becomes more of an issue with the increasing focus on CSR.[69] Which other costs are deductible in calculating taxable income, is a matter which has to be addressed.

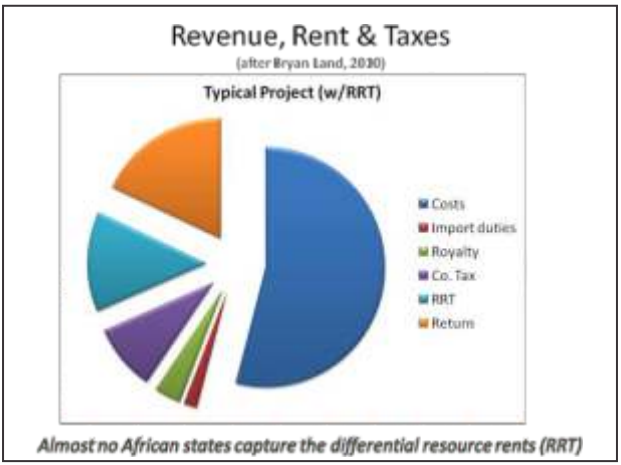
The determination of revenues can also be a challenge. Virtually all economically important minerals have a published price and it is therefore relatively easy to determine the appropriate sales revenue. Even where there is no published price, it is still possible to find a reference price to be used in determining the income of the mining company. For instance, the price of aluminium is often used as a reference for determining the income of bauxite and alumina producers. Controversy can however arise over the proper valuation of by-products, depending on the ease with which they can be separated from the main value mineral.

Where advances are obtained from project sponsors or off-takers in return for commitments to supply the mineral produced, it is necessary to ensure that the valuation of the mineral produced is transparent and at an arms-length competitive price. To avoid potential problems, the development agreement should stipulate the price references (benchmarks) to be used in determining revenues.

The meagre fiscal benefits to African governments during the "Asian Boom" were limited due mainly to the overly generous mineral policy regimes in existence in most countries, resulting from the reforms of the 1980s and 1990s prescribed by the World Bank/IMF, that generally failed to capture resource rents (no progressive taxes). Admittedly, this followed years of stagnation of the sector, due to the falling intensity of minerals in global growth (GDP), falling prices and profits and consequent under investment, mainly by state mining companies, provoking an over-compensation in the opposite direction (far too attractive mineral fiscal regimes). One important feature of most of these regimes is that the incidence of taxes is distributed in such a way over the mine's life cycle that little tax is paid until the capital invested has been recovered. Accordingly, tax payments are postponed and during times of booming prices this inevitably accentuates the impression of inequity.

[69] CSR: Corporate Social Responsibility

Figure 34: Typical Mineral Project



Source: Adapted from Land, 2008

Many of Africa's mineral regimes were revised from the late 1980s onwards with a view to promoting increased foreign direct investment for exploration and mine development. Tax rates were lowered, generous allowances were introduced for exploration and capital expenditures, import tariffs and VAT/GST were reduced or zero-rated and, in a few instances, tax holidays were granted to investors in the mining sector (the "race to the bottom"). In addition, "stabilisation clauses" that dramatically curtailed the state's ability to increase its share of boom rents, were widespread, often reinforced with external (Minority World) arbitration clauses. The framework for evaluating a country's fiscal policy was often whether or not its regime was sufficiently "competitive", viewed against those of other countries with similar geological prospectivity to attract investment for greenfields and brownfields investment, resulting in the so-called "race to the bottom". The apparent failure of these generous policy regimes to result in tangible benefits to African economies has galvanized the search for new frameworks for the sector.

3.6.3 WHY MINERAL SECTOR SPECIFIC TAXES?

Due to scarcity of exhaustible resources (Hotelling rule) they can have high economic/resource rent potential. Accordingly they generally have their own tax instruments. However, there is a tendency to use normal (economy-wide) taxes in combination with resource specific taxes. Mineral resources are finite (wasting asset) which is part of the rationale for the state to capture the extra rents: whilst the asset is still extant. Resource rents are excess profits over minimum rate of return which is required to justify investment, which are rarer or lower in other sectors, resulting in customised taxes for minerals

TAXING MINERAL RESOURCE VARIABILITY

Mineral deposits display enormous variation in grade/richness resulting in huge differences in embedded economic rent which makes it difficult to design a "one-size-fits-all" tax regime. However, deposit-by-deposit tax regimes would be problematic to design and administer, due to the lack of state knowledge of the true value of the resource at the outset (asymmetric state-investor deposit knowledge, though a resource rent tax self-adjusts for deposit "richness"). In general, there appears to be increasing consensus around the use of several tax instruments, that cater for different grades/costs and prices, to capture a "fair share" of the rent. There is now also a general consensus on the need for instruments that self-adjust to deposit richness, demand (price) and risk (progressive taxes such as a resource rent tax).

HISTORIC TRENDS IN MINERAL TAXATION:

For centuries ad valorem or in-kind royalties were the main instruments of mineral taxation. From WWII: combination of fiscal instruments- royalties, company profit taxes, withholding taxes, etc. became the norm. From the 1970s governments attempted to increase their share of economic rents through introduction of production-sharing contracts (particularly for HCs)[70], equity participation and resource rent taxes, first in HCs and later for minerals, in some countries.

[70]HCs: Hydrocarbons (oil & gas)

Box 1: Mineral Taxes

Mineral Taxes Include:

- **Direct tax instruments:**
  - Corporate income tax (plus withholding tax)
  - Progressive profit taxes (e.g. SA gold formula tax)
  - Resource rent taxes
  - Windfall profits tax, additional profit tax, super-profit tax
- **Indirect tax instruments:**
  - Royalties *Ad valorem*, specific/production volume
  - Import duties
  - Export taxes
  - VAT/GST
  - Labour levies (skills, unemployment)
  - Energy levies
- **Non-tax instruments:**
  - Competitive bonus bidding, auctions (e.g., hydrocarbons)
  - Surface fees
  - License fees
  - Production sharing contracts
  - State equity participation

Taxes on expatriated dividends and state carried equity participation (which is sometimes in lieu of dividend taxes) are also features in many fiscal regimes. Duties on imported inputs, particularly those used during the exploration or mine development phases, tend to be limited, if imposed at all. If not properly monitored, this can prevent the development of local supply systems (where it is economically viable) and hence deny the country the benefits of enhanced local backward linkages, as well as cause revenue loss through duty-free imports "leaking" into the general economy. In a number of jurisdictions, the local government system prescribes property rates which are payable to the local authority in the area in which land and structures are located. Depending on how these are valued and the rate of tax, these could yield significant revenue for the local authority from the assets of large-scale mining operations.

MINERALS CORPORATE/COMPANY TAX (CIT)

Most states apply a standard national corporate rate in the range of 20% to 30% of profits (Zimbabwe 25%). This has the advantage of a single administration and collection system (capacity). However, occasionally a deposit-specific CIT is negotiated (for some large projects), but these exceptions to the national system are cumbersome to administer and maintain (each change requires a legislative amendment).

Dividend withholding taxes on foreign shareholders are common (10-15%), to encourage re-investment in the country. Brazil also has an escalated withholding tax (25%) on companies domiciled in tax havens.

Special capital allowances for capital intensive projects (mostly 100% expensing for exploration and development) are also widespread, to attract investment into large projects. Deductions for contributions to mine rehabilitation trust funds (closure funds) are increasingly allowed.

TAX DILUTION: TRANSFER PRICING (OVER- AND UNDER-INVOICING)

TNCs are dominant in minerals and their multi-state operations enable them to exploit tax rate differentials, by deflating profits in higher-tax jurisdictions and declaring profits in lower-tax jurisdictions by:

- Sale of minerals below market prices to affiliates in low-tax jurisdictions. Many minerals do not have terminal markets (metal exchanges) especially ores and concentrates, which are difficult for the state to value: A possible remedy is to stipulate that a portion (10%) is sold by local open tender, to get a market price indicator;
- Complex price hedging mechanism between related parties : A possible remedy is to limit hedging to a max portion of production, and/or insist on open tender for the hedging instrument;
- Debt finance provided by related parties at above-market interest rates: A possible remedy is to limit debt interest rate to a function of a recognised international corporate rate (e.g. MOODCAAA plus X%?) and to limit allowable debt ratios (gearing);
- Related party excessive management fees, technical services, or HQ costs. A possible remedy is to cap HQ costs at a percentage of costs;
- High leasing fees for capital goods and machinery from related parties: A possible remedy is to insist on open tender of leasing;
- General: African states should seek assistance from OECD tax authorities – they have the same problem! Introduce OECD-type anti-transfer pricing rules (trade with associated or related parties) and ring-fencing provisions.

Box 2: Ring-fencing

- Ring-fencing mineral from non-mineral income: To limit the transfer of value from/to other sectors, to contain mineral-specfic tax instruments (e.g allowances);
- Ring-fence per deposit/project (e.g.SA): To limit the transfer of value from/to other mines, to contain mine-specfic tax instruments (e.g capex allowances);
- In general, ring-fencing could aid tax collection, limit the avoidance options, but could distort investment decisions.

While transfer pricing of production has attracted considerable attention, there is a strong possibility that transfer pricing of inputs and equipment constitutes a more important problem for governments and one less easily handled. Prices are often less transparent and tax evasion may take place through the use of non-arms- length suppliers based in tax havens. Debt service to institutions linked to the investor can cause similar problems. In this connexion, it should be noted that the G20, the OECD and the EU are all making efforts to prevent or limit the use of tax havens. These initiatives need to be tapped into.

PROGRESSIVE CORPORATE INCOME TAX (CIT)

Some states have progressive CIT to cater for deposit variability and price cyclicity (tax on profitability rather than profit - e.g., SA gold mining formula tax and the Additional Profits Tax in Zimbabwe), to attempt to capture resource rents. There are various methods of capturing these "resource rents" such as deposit specific graduated or stepped CIT rate linked to a higher unit price of the commodity, or production volume or sales turnover or profit-to-sales ratio. However, a stepped rate structure is not an accurate proxy for varying rates of return and could lead to distortions on step edges (under-reporting of income) and the monitoring is complex.

The South African gold mining tax formula with built-in progressivity, linked to level of profitability of gold mine (marginal mine taxed at 0%), increases as the return on turnover increases:

$y = a-(ab/x)$, where:

'y' = tax rate to be determined (sliding scale taxing higher profits at high rates)

'a' = marginal tax rate

'b' = portion of tax-free revenue

'x' = ratio of taxable mining income to total income

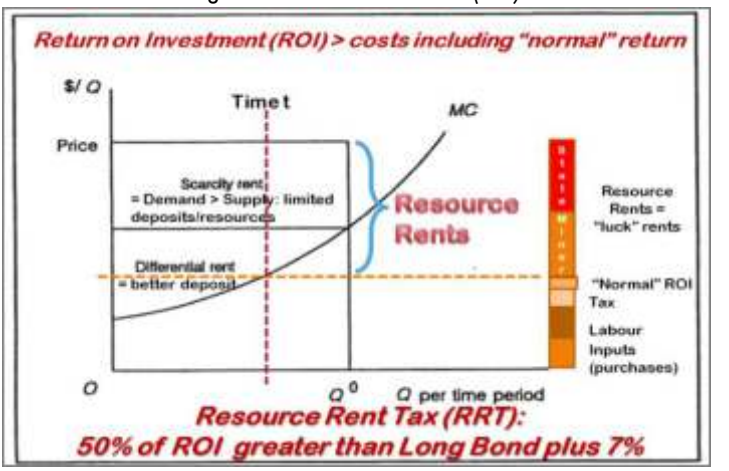
However, return on revenue is a poor proxy for return on investment. A Resource Rent Tax (RRT), like the Additional Profits Tax (APT) would more accurately target resource rents (return on investment). Progressive taxes encourage mining at average grade (disincentives high-grading) and therefore tend to maximise ore extraction.

RESOURCE RENT TAX (RRT)

David Ricardo proposed that Economic Rent is a surplus of individual investors' paper profit (which has its value in control over resources rather than directly in the resources themselves) over societal gain. As such, it does not represent any gain but rather an unearned transfer of wealth. Accordingly it is argued that there is a need for a Resource Rent Tax (RRT) on mineral exploitation. An RRT usually includes the following:

- It triggers in after a threshold real rate-of-return (RoR) on investment has been achieved by the investment/project.
- The hurdle rate (threshold) approximates the "expected" (average) rate of return for the jurisdiction. Best linked to the state long-bond rate plus a premium (+7%?) to self-adjust to country risk.
- RRT is calculated by increasing annual cash flow by threshold RoR and carrying it forward until it turns positive- when the RRT triggers for all future after tax profits (other taxes are usually allowable as costs).
- The RRT rate is generally from 20% to 50%, but there is an argument for differential rents (embodied in the asset) to be shared equally between the asset owner and the concessionaire (50/50).

Figure 35: Resource Rent Tax (RRT)



However, few African states apply a RRT, due to:

- Perception that it would make them less attractive for FDI;
- Strong opposition from mining companies;
- Short-term vision of politicians (back-loaded- will only trigger in after their tenure- inter-generational)
- Perception of complexity (but no more complex than CIT)

An RRT is generally applied in on top of other taxes (CIT, royalty), as deposits with RoR below the threshold will never pay it.

Table 17: RRT in Africa

Country	Sector	Year/s	Type
Ghana	HCs	1984	contractual
Tanzania	HCs	1984	contractual
Ghana	Minerals	1985-2003	Law
Madagascar	HCs & Minerals	1980s	Law
Namibia	HCs	1993	Law
Zimbabwe	Minerals (SML)	1994	Law
Angola	HCs	1990s	contractual
Malawi	Minerals	2006	Law
Liberia	Minerals	2008	Law

Adapted from Land, 2010, p243

Resource rent tax (RRT) mechanisms, which are imposed on the profit of the project or company after deduction of a "normal" rate of return on capital, seek to implement the basic concept of rent apportionment. There seems to be some ambivalence to them within the mining investment community. This ambivalence has been dramatically illustrated by the vociferous opposition to the recent proposals for a resource rent tax (super profit tax) in Australia. For a discussion of the Australian proposals, see Garnaut 2010[71], particularly the relative efficacy of a RRT compared to a so-called "Brown Tax" (which was the original proposal in Australia's mineral tax review)[72]. Despite this ambivalence by mining companies, it is generally recognized that a resource rent tax has the advantage of being neutral with respect to its impact on investment. Thus, unlike other taxes, it causes no distortion of incentives. On political philosophy grounds it is also argued that Governments have the right to capture all or part of the mineral resource rents as the owners of the resources.

The basic elements addressed in such resource rent tax schemes include: (a) the threshold rate of return after which the tax should be imposed; (b) the rate of tax to be imposed; (c) whether the impost should be on each project ring fenced from others or on a group of projects by the same investor; and (d) what deductions should be allowed from income for

[71]Ross Garnaut 2010, "The New Australian Resource Rent Tax" University of Melbourne.
[72]Government of Australia 2010, Henry Tax Review, http://taxreview.treasury.gov.au/content/Content.aspx?doc=html/pubs_reports.htm

tax purposes. Land (2008 & 2010) provides recent discussions on resource rent taxation in the minerals industry.

It deserves to be noted that one of the most controversial elements of the Australian resource rent tax as originally proposed was the threshold rate of return. A possible way of getting around the difficulty of determining a specific rate could be to link it to the long term yield on bonds issued by the host country, since this yield can be expected to incorporate country risk. A threshold rate corresponding to this yield plus, say, 5 to 7 per cent, would appear to be equitable in almost all cases. States that do not as yet issue Treasury long-bonds, a clause could be inserted in their revenue codes and/or MDAs[73] that states that once a long-bond is issued, the RRT threshold will be the rate plus 500 – 700 basis points. Until then the state concerned would have to estimate a fixed threshold (around 10% to 20% for most African states). As for the rate of the resource rent tax, there is considerable support for a 50 rate, although it should be noted that Papua New Guinea has applied a 75 per cent rate for many years. A RRT is one of the least distortionary of the usual mineral tax instruments, as it does not sterilise resources which high royalties could do. Marginal deposits would never breach the RRT threshold and therefore a high RRT rate would not impact on the investment decision for such a deposit.

"Resource rent taxation has a reputation for administrative complexity, which may weigh against it:

- RRT has mostly the same information and audit requirements as conventional income taxation. The main differences are:
- the project ring-fence basis for assessment (typically only relaxed for exploration expenses) but ring-fencing is not unique to RRT;
- the cumulative rather than annual income basis of assessment… this is mainly a computational issue (there may be an issue over prior year records);
- the cash flow rather than accounting basis for assessment – non- tax cash charges, like depreciation are not used … this may add to the burden of the audit function;
- Tax leakage safeguards (dealing with transfer pricing, thin capitalisation, allocation of overheads, expenditure verification) are no different from those needed for any other kind of profits taxation.
- Tax administrators would need training on conceptual underpinnings of RRT (discounted cash flow, cost of risk capital, investment returns, etc)"[74]

MINERAL ROYALTIES

It is usually recognised that some recompense is due to the owner/country once its minerals are extracted and sold, regardless of whether or not the seller reports a profit, though account ought to be taken of the potential adverse effects of high upfront payments on the development and operation of mining projects.

Royalties are the oldest form of mineral taxation: Usually imposed on value of mineral sales (ad valorem) or a set charge per production volume (specific). Historically royalty was in kind (volume/weight). Royalties are a factor payment or consideration for the right to deplete the national asset (similar to capital and labour input costs). However, due to local ownership claims some jurisdictions share royalty proceeds between central and local levels of government. This effectively privileges mineral rich regions.

Royalties have the advantage of being front-loaded, giving the state much-needed immediate receipts from first production. However, they add to working costs and consequently increase economic cut-off grade of a mineral deposit (i.e. could sterilise marginal deposits).

There is generally a transfer pricing problem (under invoicing) for mineral products without terminal markets (e.g. LME)- which implies a need for state capacity to determine market prices. The state could insist on local open tender sales of a proportion of production, to get a market price and to facilitate local VA (value added).

Some states decrease royalties with increasing VA to encourage local beneficiation (VA). However, this is only effective if the mining company beneficiates, unless it is applied to exports, then it equates to an export tax, (below).

Royalties should be based on value at mine gate, but several states find it simpler to apply them at the port (FoB pricing to determine value) – thus effectively becoming an export tax (below).

Royalties are the principal means for ensuring that the country obtains some minimum of the value of the mineral produced. These may be imposed as an amount per unit of production (unit-based); or at a rate based on the value of the mineral sold; or, less commonly, on the basis of the profits from or the profitability of the mining operation. In addition to ensuring that at least a minimum amount is paid in taxes, royalties have the advantage of being relatively easy to determine and collect, and thus pose less demand on the sophistication of the government's tax auditors. Otto et al. (2006) provides a comprehensive account of the different forms of royalty. Royalties are generally applicable on the value of the minerals at mine-gate, to recompense the state for the loss of the resource, whether or not a profit is made.

[73]MDA : Mineral Development Agreement
[74]Land, Bryan, ppt to IMF Conference on " Taxing Natural Resources" Washington 2008

However, if royalty rates are set too high they will sterilise marginal deposits/reserves as they are effectively a working cost.

MINERAL EXPORT TAXES

Mineral export taxes are usually applied on the FoB value of mineral exports. Used in order to:

- encourage local beneficiation (VA);
- protect strategic feedstocks for local consumption;
- raise revenue (not efficient);

Almost no African states use mineral export taxes (but used extensively by NICs: China, Russia). It could be an effective instrument to facilitate mineral VA, where there is a clear business case for beneficiation. However, they are strongly opposed by OECD who fear limited access to mineral resources (curtailed in EU Economic Partnership Agreements and EC "Raw Materials Strategy")[75].

An export tax could be distortionary if set too high (>5%) as it is effectively a second (export) "royalty", adding to working costs (thus increasing the hurdle rate and consequently would sterilise deposits/reserves). It should only be applied to selective minerals, after a feasibility study on the next step of processing shows economic viability.

OTHER INDIRECT TAXES

Import duties: These should ideally be an industrial development instrument, but in many states it is unfortunately applied as a fiscal instrument, Nevertheless, many states offer exemptions due to the capital intensity of large mineral projects. These exemptions should only be for the capex phase of the project (1 to 3 years), if at all, to encourage backward linkages for the on-going project consumables (opex).

VAT/GST: African mineral production is mostly exported (zero-rated in terms of standard destination-based VAT system). Consequently, some states have made mining project imports; VAT free, but due to weak VAT administrations (tardy refunds) this effectively disadvantages local suppliers (backward linkages) and should be avoided (mineral project imports should attract VAT/GST and import duties);

Labour Levies: For skills development, unemployment benefit, etc. They are usually applied on the value of wages (pay-roll). Although these also add to costs, there is a "normal" necessary level that responsible companies have to invest to renew/develop their skills assets in order to generate returns. This would be the minimum obligatory level, which would not impact on "responsible" companies, but would oblige companies that rely on poaching skills to contribute to the national skills pool.[76]

STATE EQUITY

State equity is equivalent to CIT (but maintains the national CIT rate). State equity could:

1. Secure higher slice of economic rent in times of buoyant commodity prices (in lieu of super-profit or additional profits taxes);
2. Enhance stability and prevent renegotiation of fiscal terms (but an RRT could be more effective);
3. Increase government influence on establishing mineral linkages (in lieu of effective laws/regulations?) and other national development objectives (however, state representatives on the boards of mining companies are often "captured");

Equity can be costly for paid-up equity and carries potential conflict of interest as regulator and player (e.g. environmental and labour laws). Investors tend to prefer government's role as regulator and tax collector, with equity less than 15%. State equity participation is realised in many forms:

- Commercially transacted paid-up equity
- Paid-up equity on concessional terms
- Carried interest- government pays for it out of production proceeds
- Tax exchanged for equity (reduced tax liability)
- Equity in exchange for state infrastructure provision
- Free equity or "free carry" (less transparent as taxes may be offset)
- Combinations of the above

OTHER FORMS OF MINERAL REVENUES

Some other forms of revenue from mining are:

An upfront "bullet" payment (auction, public tender), which could be costly as the state will generally get more from back-loaded instruments because it invariably has a lower discount rate than the investor;

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[75]European Commission 2011, "Tackling the Challenges on Commodity Markets and on Raw Materials", COM(2011) 25 final, Brussels, 2.2.2011

[76]The SA Mining Charter sets the "normal" target at 5% of pay-roll.

Surface fees: Usually on area ($/Ha), which assist in limiting exploration and mining areas to economic targets and avoid the "sterilisation" (squatting) of potential mineral assets. They need to be set as a very low as a percentage of costs in order not to increase the hurdle rate and sterilise potential projects (especially large marginal projects). For the exploration stage, a better instrument is an annual minimum work ($/ha) obligation.

Capital gains tax on exploration "flips": To discourage opportunistic speculators, a capital gains tax (CGT) could be considered for exploration licenses that are "flipped" before mineral production (mining license). The tax would apply to the difference between the flip price and total allowable exploration spending to the flip date.

License fees: These are necessary to filter out opportunists, but need to be low enough to not discourage serious explorers/investors;

FISCAL STABILITY CLAUSES

As many have pointed out, it is important not only to focus on particular elements, but also on the overall tax package. In many large-scale projects in Africa, sponsors (and their lenders) have sought and obtained assurances that there would be no additions to the total tax package agreed to initially (save for minor taxes up to a specified amount). During the recent period of high prices and profits, where the agreed regimes have not earned countries commensurate shares of the higher profits generated, the pressure on governments to impose additional taxes in spite of such stabilisation clauses has proved irresistible in several instances. This reinforces the argument on the necessity to develop fiscal regimes that uphold equity during booms and busts in the mineral price cycle.

Stability clauses facilitate the raising of capital for investment in large projects. However, the clauses are often unnecessarily broad and extensive. In principle, there should be little need for the assurance to the investor provided by stability clauses on discrete tax instruments beyond the tenure of the initial loans.

If taxes are deferred continuously, the pressures for renegotiation grow… Hence, most investors seek fiscal stability clauses. The perception of fiscal stability is enhanced if tax measures are introduced that correlate tax take closely with the rate of return, such as progressive profit taxes, such as a RRT.

Fiscal preservation clauses may initially appear attractive, but over long run prove to be very expensive as it limits state ability to change fiscal terms in face of 'super profits'. There are different forms of stability clauses such as freezing rates and the tax base definition and a guarantee of the investor share of economic rent. These could be administratively complex if applied per project. Fiscal stability clauses should only be used sparingly, and then only on discrete fiscal elements and only for the duration of the initial loans (max 7 years?).

3.6.4 MINERAL TAXATION IN ZIMBAWE

The Zimbabwean tax regime is fairly complex in comparison with other states in the region, with the exception of SA. The normal corporate tax is 25%, but there are numerous other direct and indirect taxes as well as fees and levies. Several tax instruments apply only to minerals, such as royalties, marketing fees (MMCZ)[77], Additional Profits Tax (APT, but only Special Mining Leases) and surface fees (retention fees).

Table 18: Zimbabwe- Taxation

Tax	Governing legislation	Applicable to mining operations	Applicable to other taxpayers operations
Corporate Income Tax	Income Tax Act	Yes	Yes
Aids Levy	Income Tax Act	No	Yes
VAT	Value Added Tax Act	Yes	Yes
PAYE	Income Tax Act	Yes	Yes
Capital Gains Tax	Capital Gains Tax Act	Yes	Yes
Withholding Taxes	Income Tax Act	Yes	Yes
Additional Profits Tax (APT)	Income Tax Act	Yes (only SMLs)	No
Customs Duties	Customs and Excise Act	Yes	Yes
Royalties	Mines and Mineral Act	Yes	No
Marketing Commissions (MMCZ)	Mineral Marketing Corporation Act	Yes	No

Source: Deloitte, 2012 (from COMZ)

[77]MMCZ: Minerals Marketing Corporation of Zimbabwe

There are several taxation rules where mining companies are treated differently to companies operating in other sectors of the economy, both positively and negatively.

Table 19: Zimbabwe- Sector Taxation Comparisons

Item	Normal Miners	SML Miners	Petroleum Operators	Farmers	Life Insurance	Others
Special rules for taxable income	Yes – 5th Schedule	Yes-22nd & 23rd Schedule	Yes- 20th Schedule	Yes – 7th Schedule	Yes – 8th Schedule	Yes – 4th Schedule
Normal Tax	25%	15%	25%	25%	25%	25%
Aids Levy	No	No	No	Yes	Yes	Yes
Additional Tax	None	Yes- APT	None	None	None	None
Capital Allowances	100%	100%	100%	Some at 100% (7th Schedule) & others at SIA or W&T	As per others	Allowed equally over 4y unless SME where it is proposed to be over 3y with 50% in 1st year.
Expiry of Tax losses	No Expiry	No Expiry	6 Years	6 Years	6 Years	6 Years
Recoupment	Full Sales Value	Limited to Cost claimed	Limited to Cost claimed	No recoupment on 7th Schedule allowances	Limited to allowances granted	Limited to allowances granted
Royalties and Statutory Commission	Yes	Yes	No	No	No	No
Export Incentives	No	No	No	No	No	Yes – 20% CIT for >50% manufactures exports by volume.

Source: Deloitte, 2012

The current mineral tax system is complex and is in urgent need of overhaul. The main mineral fiscal revenue instruments are surface fees (area retention fees), royalties, CIT, withholding taxes and duties. Special Mining Leases have their own tax regime with a lower CIT and royalty, but with an Additional Profits Tax (APT) that varies with the CIT rate (current rate of 41.5% on profits above a 15% return). There are only two SMLs: Zimplats and Unki, both PGM miners.

Box: Zimbabwe- Mineral Taxes

Standard (as of January 2011)

- Ad valorem royalty
  - Diamonds 15%
  - Platinum 10%
  - Precious stones-10 %,
  - Gold 7%
  - Other Precious metals- 4%
  - Base metals and Industrial minerals- 2%
  - Coal- 1%
  - discretionary exemption
- Corporate Income Tax (CIT)
  - 25% flat
  - Special Initial Allowance (100% write-off of capex)
  - Deductions for royalty, interest
  - Expensing of exploration, stripping, shaft sinking
  - Unlimited loss carry forward
  - CSR payments not recognized
  - Mine closure provisions not recognized
  - Mine-by-mine ring fence (except for exploration)
  - Presumptive tax of 2% on gold sales of ASM
- Withholding
  - Dividends 20% (non-resident)
  - Interest 10% (non-resident)
- VAT
  - 15% input VAT payable but qualifiesfor deferment zero-rating for exports
- Duties
  - Variable rates; for certain items duty exemption replaced rebate system in 2011
  - Export duty on semi-processed chrome ore of 20%
- Other fees and levies
  - MMCZ marketing levy of 0.875% on mineral sales other than gold
  - Area retention fees; environmental levies

Varied for Special Mining Lease (SML)

- Contractual stabilization
- CIT
  - rate of 15%
  - Exploration expensed; development depreciated 25% per year
  - Full ring fence*
- Additional Profits Tax
  - Negotiable – only 2 SMLs
  - 2 tier: 15% and 20% rates of return
  - Rates: vary with CIT rate – at current CIT rate first tier APT rate is 41.5%
- Full duty exemption for 5 years

Note: The mining tax regimes would apply to the holder of a mining interest held by virtue of the indigenization law

Source: Adapted from COMZ, 2012

Royalties

Mineral Royalties have been increased several times recently and are now the highest in the region, if not the world. Royalties are a crude and destructive tax instrument because they add to costs (based on value of output) and thereby raise the cut-off grade and consequently sterilise resources and curtail mining activity. However, they do have the advantage of being less susceptible to tax evasion, particularly transfer pricing, than taxes on the surplus produced (susceptible to over-invoicing of costs).

Table 20: Mineral Royalties- Regional Comparison

Zimbabwe	1% - 15%	Diamonds 15%, Platinum and Precious stones-10 %, Gold 7% Other Precious metals- 4% Base metals and Industrial minerals- 2% Coal- 1%
Angola	2% - 5%	Stones and precious metals - 5% (semi-precious stones- 4%) Metallic minerals - 3% Others minerals- 2%
Botswana	3% - 10%	Precious stones- 10%, Semi-precious -5%, Other-3%
Mozambique	3% - 10%	10% on diamonds and precious metals (Au, Ag, Pt))and precious stones, 6% on semiprecious stones; 5% on basic minerals; 3% on coal and other mining products
Namibia	4% - 5%	Precious metals - 5% Base and rare metals - 5%, Semi-precious stones - 4%, Industrial minerals - 4%.
Tanzania	2%- 12.5%	A 3% royalty is charged on gold and all other minerals 5% on diamond and 12.5% for petroleum and gas.
Zambia	3%-5%	Precious metals and stones -5% Base Metals – 3%

Source: Deloitte, 2012

In addition, the Indigenisation Law of 2007 could result in a quasi-tax, depending on how the 51% equity is to be financed. The composite mineral tax regime is both onerous (by both regional and international comparisons) and inefficient in terms of optimising the revenue from mining, whilst still attracting investment in mining and growing the sector.

Table 21: Effective Tax Rate and Level of Profitability

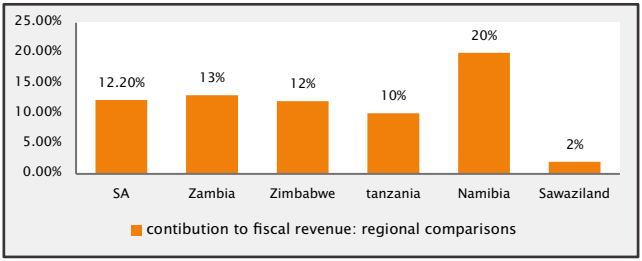
Net Profit % (excl. royalty payments)	10%	20%	30%	40%	50%	55%	60%	65%	70%
Revenue	100	100	100	100	100	100	100	100	100
Total Costs excluding Royalty	(90)	(80)	(70)	(60)	(50)	(45)	(40)	(35)	(30)
Royalty	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)
MMCZ	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Taxable Income	2	12	22	32	42	47	52	57	62
Normal Tax	(1)	(3)	(6)	(8)	(11)	(12)	(13)	(14)	(16)
Profit After Tax (PAT)	2	9	17	24	32	35	39	43	47
PAT % of Revenue	2%	9%	17%	24%	32%	35%	39%	43%	47%
Total taxes plus royalty	(9)	(12)	(16)	(20)	(23)	(25)	(27)	(29)	(30)
PAT & levies	1	8	14	20	27	30	33	36	40
Effective Tax Rate- on Profit before tax (Pbt)	25%	25%	25%	25%	25%	25%	25%	25%	25%
Effective Total Tax Rate on adjusted Pbt	86%	61%	53%	49%	46%	45%	45%	44%	43%
Utilization of Revenue Earned									
Revenue	100	100	100	100	100	100	100	100	100
Spent on Costs	(90)	(80)	(70)	(60)	(50)	(45)	(40)	(35)	(30)
Paid to Government	(9)	(12)	(16)	(20)	(23)	(25)	(27)	(29)	(30)
Paid to Shareholder after WHT on Dividends	(1)	(8)	(14)	(20)	(27)	(30)	(33)	(36)	(40)

Source: Deloitte, 2012

Table 21, above, appears to indicate that the current mineral taxation regime inordinately prejudices marginal or low profit miners as compared to higher profitability operations which could lead to the sterilisation of marginal deposits, with concomitant loss of employment, fiscal revenues and markets for supplier industries.

Despite the current low capacity levels and high costs of production the sector's contribution to the fiscal revenue is fairly comparable to the sub-region. In SA, Zambia, Tanzania and Swaziland the contribution are 12.2%, 13%, 10% and 2% respectively.

Figure 36: Contribution to Fiscal Revenue: Regional Comparisons



Source: Kwesu, 2012

The current mineral fiscal regime is sub-optimal because it fails to balance maximising state revenues with encouraging investment in new exploration and mining. It tends to add to costs (relatively high royalties, fees, levies) thereby sterilising resources, rather than focussing on getting an equitable share of the surplus (profit) generated. However, although taxes on surpluses (including resource rents) could yield larger revenues to the state over the longer term through a higher rent share, through (1) increased new exploration and mining investments and (2) the exploitation of more ore (minimisation of the cut-off grades), these revenues will tend to be "back-loaded" over the life of the mine: i.e. they will generally come later than taxes based on revenue or costs, due to high start-up costs (capex) for most mineral developments (capital expensing provisions) and resource rent return thresholds. Yet there is a clear national need to increase fiscal revenues from mining in the short to medium term!

Consequently there are two, apparently contradictory, state mineral fiscal objectives-

1. to maximise the returns to the state from its mineral endowment (over life of mine) as well as
2. to garner short-term income to ameliorate the current fiscal revenue crisis,

However, this conundrum could be finessed through a judicious combination of tax and hedging instruments.

An optimal mineral fiscal regime should minimise taxes that add to costs and maximise taxes on the surplus generated.

3.6.5 FISCAL PROPOSALS

CIT

The CIT rate is within international and regional norms and the minerals sector should continue to pay at the national rate of 25%.

ROYALTIES

Royalties are generally above global norms, sterilise resource and constrain mining activity. Consideration should be given to reducing them to a single rate of 1% to 2% of sales for all minerals and compensating the fiscus through a RRT on all minerals (below). Over the life-of-mine, the RRT will yield much higher revenues on significantly greater production (lower hurdle rate) than the current royalties' configuration.

RESOURCE RENT TAX (RRT)

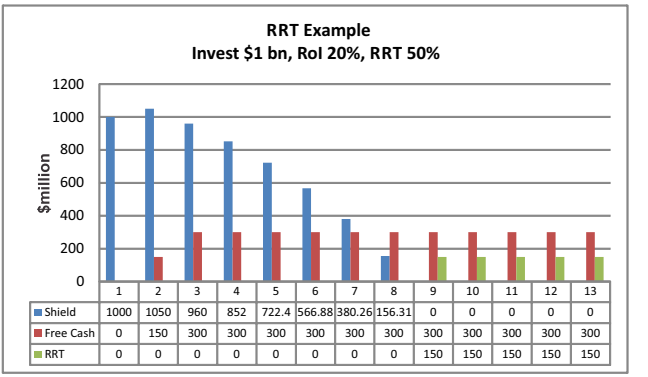
Resource Rent Taxes (such as the SML APT) are generally considered to be the least distortionary of tax instruments as they do not impact on investment decisions for average or marginal resources (they only trigger in above a threshold return set at the "expected" return). Strong global mineral demand (Asian growth) has resulted in a high global minerals intensity of GDP and much larger resource rents (scarcity rents from higher prices) and this situation is expected to continue (see section 3.2). Zimbabwe accordingly needs to ensure that it captures an equitable share of these resource rents while they last.

A resource rent tax of 50% on all minerals should be considered that triggers at the "expected" rate of return on investment (ROI). The current SML APT is overly complicated and open to interpretation. Instead of making the rate a

function of the CIT rate, a simpler methodology could be to allow all other taxes (CIT, royalties, levies, fees) as costs before applying the RRT to the remaining free cash. Withholding taxes would be still applicable on dividends declared after the payment of RRT. All legitimate investments would be carried forward at the RRT trigger rate (threshold) creating a "RRT shield" that would be drawn down annually by the free cash. Once the RRT shield has been consumed, the investment/s would have made the threshold rate of return and the RRT will trigger in. Any further investments would recreate the RRT shield and the same procedure would be followed (a generic wording of RRT legislation is attached as Appendix 6).

The RRT threshold (the expected return on investment) would vary depending on investor's perception of the risk, particularly sovereign risk. Accordingly, a premium on the Treasury long-bond rate could be used as this will move in tandem with the market's perception of Zimbabwean investment risk. The Australian RRT uses the long-bond rate plus 7% which could be applied in Zimbabwe once the Treasury recommences issuing long bonds (10 year or greater). Until then the APT threshold (20%, tier 2) could be used as a provisional RRT trigger. On introduction, the RRT could be back-calculated over the 5 years previous to the imposition, which would recognise all the past investments and free cash generation (over 5 years) for determining whether the past returns on investment have breached the RRT threshold. A simplified example of an RRT on a new investment of $1 billion is given in Figure 37.

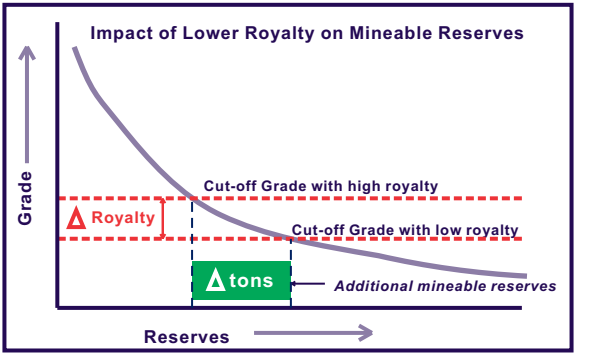
Figure 37: RRT Example for an investment of $1,000mn



	1	2	3	4	5	6	7	8	9	10	11	12	13
Shield	1000	1050	960	852	722.4	566.88	380.26	156.31	0	0	0	0	0
Free Cash	0	150	300	300	300	300	300	300	300	300	300	300	300
RRT	0	0	0	0	0	0	0	0	150	150	150	150	150

Given that most deposits embodying resource rents have most probably already received the threshold return, there may not in fact be a difference between the revenue from the current high royalties and revenue from the proposed RRT with a low flat royalty rate (there may be a positive immediate impact on the fiscus, even in the short-medium term). Consequently, ZIMRA should be resourced to undertake an appraisal of the likely impact and resulting revenue differential, if any. In effect, this proposal shifts the tax burden from marginal-average return deposits to high return operations and would also drop all cut-off grades (lower royalties) and stimulate investment in more new mines and the mining of more reserves from existing operations. A conceptual graph illustrating the effect of high royalties on exploitable resources is presented in figure 38. In addition to the sterilisation of potential reserves at operating mines, the figure shows that new investment projects (mines) that fall between the two cut-off grades would also become non-viable at the higher royalty rate.

Figure 38: Conceptual Impact of Royalty on Exploitable Resources



Nevertheless, given the current dire need for state revenue, if the Zimra appraisal indicates a revenue short fall in the short-term (but gain in the longer term), consideration could be given to making a portion (say, 30%) of the projected RRT (as per the company's work-plan) an advance to the fiscus at an international average interest rate, such as the Moody's Corporate Bond Index Rate (MOODCAAA) plus, say, 3%, in equal instalments over, say, the next 7 years (by which time all operations containing resource rents should have started contributing RRT). This is in effect hedging 30% of the projected RRT at MOODCAAA plus 3%. Alternatively the same could be done for the projected royalty over, say, 10 years, to generate royalty fiscal receipts immediately and RRT receipts later (10 years of royalties at 1-2% should yield around $200M to $400M immediately).

As Bryan Land (2008) points out: "RRT has mostly the same information and audit requirements as conventional income taxation," and "Tax leakage safeguards (dealing with transfer pricing, thin capitalisation, allocation of overheads, expenditure verification) are no different from those needed for any other kind of profits taxation." Nevertheless, the scope for transfer pricing is greater than that for royalties (can also over-invoice costs for RRT) and consequently ZIMRA needs to be appropriately capacitated to minimise leakages. This could be reinforced by obligating all mining operations with revenue above a threshold (say, $100mn/an) to pay for a periodic (say, every 5 years) forensic tax audit reporting to ZIMRA.

RRT SOVEREIGN WEALTH FUND (SWF)

Although multiple currency system has meant that sudden inflows from commodity price spikes will not result in the Dutch Disease appreciation of the local currency causing other exports to become uncompetitive, the other manifestations will still occur such as the sucking in of scarce national capital and skills into the resource boom sectors. A sudden inflow of dollars due a resources price spike would also fuel inflation in non-tradables particularly financial and professional services. Consequently, consideration could be given to putting RRT revenues into a SWF with three possible disbursement windows:

1) Long-term Human and Physical Infrastructure Fund. The fiscus would draw on these funds for investment into long-term physical infrastructure (road/rail, power, telecoms) projects and human resources development, particularly the production of technical cadres (engineers, scientists, technicians) with investments into maths and science capacity at primary, secondary and tertiary education levels, to build the future competitiveness of the economy (contributing to inter-generational equity).
2) Minerals Development Fund: This fund could finance the massive investment required for geological survey to acquire a better understanding of the geology and to uncover new exploration targets. It could also fund the development of targets for tender or development by the state (or sub-contractors), the development of a national minerals technology capacity in partnership with the private sector, and investments into the backward and forward mineral linkages industries in partnership with the private sector. Finally, it could also fund immediate redemption of private exploration expenditure through negotiable tax certificates, to stimulate the delineation and development of new mining operations;
3) Fiscal Stabilisation Fund: A major proportion of the RRT revenues could be accumulated into a stabilisation fund to be drawn down by the fiscus when commodity prices fall below predetermined long-term projections,[78] protecting the budget from revenue shocks; This fund would, over time, become a Future Fund[79] (intergenerational equity) for the nation to draw on as mineral resources are depleted (finite endowment).

When (if) a local currency is re-launched the RRT Sovereign Wealth Fund should be kept offshore to protect the currency and the economy from the classical Dutch Disease effects (currency appreciation).

MINERAL EXPORT TAXES

Mineral export taxes are effectively a second royalty for most minerals and accordingly should be used with great circumspection and only be used to stimulate forward linkages (beneficiation) and not as a fiscal revenue instrument. A configuration that could minimise the negative impacts (resources sterilisation) would be to stipulate in all mining leases that the company must undertake a feasibility study on the next value addition step, five years after first production. The feasibility study should be undertaken by independent world-class consultants selected from a list of four, supplied by government. If the feasibility study indicates a real rate of return greater than 10% then government would reserve the right to impose an export tax of up to 5% on all exports of the beneficiated product/s.

WITHHOLDING TAXES

The current rates for withholding taxes on dividends are high for non-resident shareholders and could be reduced. However, for companies registered in tax havens, there will always be a strong incentive to transfer price in order to rather declare profits in the lower tax jurisdiction. Brazil has tackled this problem by imposing a 25% withholding tax on dividends to entities registered in "tax havens", thereby diminishing the incentive to invest from a tax haven. Zimbabwe could explore efficacy of introducing a similar instrument (perhaps at a withholding rate of 30%?).

[78]Similar to the functional Chilean Stabilisation Fund
[79]Similar to the Norwegian "Future Fund"

Table 22: Withholding Taxes – Country Comparisons

Country	WHT on Contracts	WHT on Royalties	WHT on interest	WHT on dividends	WHT on remittances	WHT on fees
Zimbabwe	10%	15%	15%	15% & 20%(NR)	15%	15%
Angola	5.25%	10%	15%	10%	5.25% or 3.5%	5.25%
Australia	46.50%	0%, 30% (NR)	10%	30%	30%	N/A
Botswana	3%	15%	15%	7.50%	N/A	15%
Canada	N/A	25%	25% (RP)	25%	25%	25%
Chile	35%	30%	35%	35%	35%	35%
Ghana	5%	10%	8%	8%	15%	10%
Mozambique	20%	20%	20%	20%	20%	20%
Namibia	N/A	10.50%	10%	10%	N/A	N/A
South Africa	N/A	12%	N/A	N/A	N/A	N/A
Tanzania	2%	15%	10%	5% & 10%	N/A	5%
Zambia	15%	15%	15%	0%	15%	15%

Source: Deloitte 2012, from COMZ

RETENTION FEES

Retention fees also add to costs (>cut-off grade) and would appear to be obsolete once all licenses/leases are time-bound (tenure) with minimum work (exploration) or production (mining) targets (minimum requirements to retain the license/lease). Consequently consideration should be given to scrapping them in the new Act.

HRD (R&D) LEVY

The Zimdef levy is currently 1% of payroll. Given the seminal importance of building technical skills to the establishment of the critical resources upstream and downstream linkages industries, consideration should be given to a Mining Lease condition that at least 5% of the corporate pay-roll be spent on knowledge development (HRD and R&D), in addition to the Zimdef levy, and the creation of a dedicated Minerals Sector Knowledge Fund, in partnership with the industry. The Fund could also finance the development of mineral technologies (R&D) together with the private sector, which, from international experience, are critical to using the mineral industrial linkages sectors (back/forward) to catalyse industrialisation. Current expenditure by mining companies on local HRD and R&D could be funded by the putative Knowledge Fund, meaning that responsible companies that are already spending around 5% of pay-roll on local skilling and technology would not be impacted.

MARKETING LEVY

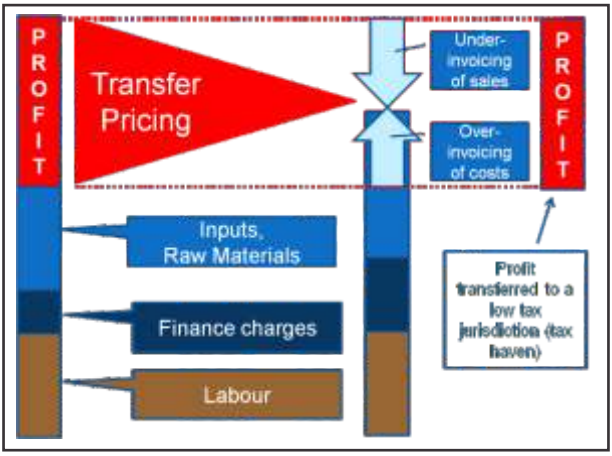
The current MMCZ marketing levy of 0.875% should be reviewed to ensure that it is cost reflective using international mineral trading commissions as benchmarks. Gold sales to the Reserve Bank should be reintroduced through resolving the outstanding debt issues, and the state gold refinery (Fidelity) should be reactivated.

TRANSFER PRICING

Mining companies generally have more scope to transfer price because their products are mainly exported and often a large proportion of their inputs are imported. This is more the case for foreign mining companies with operations in numerous countries where it becomes extremely difficult to determine if a supplier or purchaser is a related or associated party. Foreign companies domiciled in tax havens (or lower tax jurisdictions) will always have a strong incentive to transfer price (move profits to the lower tax jurisdiction) in order to maximise returns to shareholders. In addition, they are generally much better resourced to disguise transfer pricing than the revenue authority (Zimra) is to uncover it.

However, this is also a challenge faced by OECD countries and in this regard Zimbabwe should seek assistance from well-resourced revenue authorities. In addition, consideration should be given to introducing a "Forensic Tax Self-Audit" under which the mining company would fund a 5-yearly audit by a reputable auditing company, selected from a list of four supplied by Zimra, and the audit would report to Zimra. The audit ToR would focus on transfer pricing (over and under invoicing) and the generic ToR template should be agreed upon between government and the industry (COMZ) as both are ostensibly opposed to transfer pricing.

Figure 39: Transfer Pricing- the export of profits



However, given the corporate costs (both external and internal) of such an obligation, it could be restricted to the larger operations with a turnover of, say, greater than $200 million. Also, given that the scope and incentive for transfer pricing is much greater for foreign companies, consideration could be given to making it applicable to them only.

INDIGENISATION AND FDI

The 51% indigenisation target under "Indigenisation and Economic Empowerment Act" of 2007 could be considered as a "quasi tax", depending on how the equity is funded, especially if it is configured as a free-carry or as a "vendor loan" to be serviced by the future dividend streams. Reports appear to indicate that 10% will be earmarked for a community equity holding and a further 10% for an employee shareholder scheme.

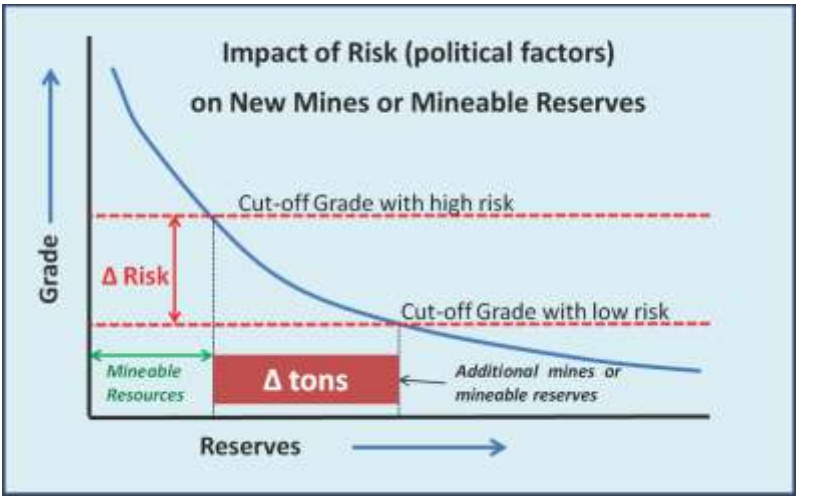
The Zimbabwean government needs to decide whether or not it wants FDI in the minerals sector. There are several successful erstwhile resources-based states that reserved mineral resources development for nationals or the state at some point in their development (e.g. Finland, Sweden, China). However, the advantage of FDI is that it brings in much-needed capital, technology and skills to rapidly realise mineral potential, rather than depending on the much slower development by cash-strapped national capital. The disadvantage of FDI is that foreign investors are generally less likely to maximise the crucial economic linkages, due to their global perspective, than is national capital.

Figure 40: The Minerals FDI Trade-off

Figure 40 outlines some of the key issues in the FDI versus development (linkages) question. However, it could be possible to balance the two strategies through putting in place the requisite regulatory instruments (e.g. a resource rent tax) and licence/lease conditions (e.g. back/forward value addition milestones) and building the necessary state capacity to effectively implement them: i.e., "riding the tiger"!

The 51% indigenous equity target as it stands will be a major deterrent to FDI. "Except for very lucrative known deposits, it also seems unlikely that new greenfield investments or major expansions [will] take place.".[80] It could in effect limit FDI to very rich deposits only, but it is often the less attractive deposits with complex geology/mineralogy or metallurgy that FDI might realise with its access to global skills and technology. Government appears to be split over the issue[81] and it is also opposed by the union confederation (ZCTU)[82], who claim that it "will only enrich the elite aligned with President Robert Mugabe's ZANU-PF party".[83]

Figure 41: The Impact of Political Risk



Consequently, the government needs to come to an agreement on whether or not it wants to use FDI to develop the nation's mineral assets and, if it does, then it needs to develop a clear policy for governing FDI, given the drawbacks outlined in Figure 40, above, in order to maximise the advantages (capital, skills, technology) and minimise the disadvantages (low realisation of linkages). Many states have effectively used FDI, such as Norway in hydrocarbons, where they managed to make the linkages despite the use of FDI, through good governance of the oil trans-nationals.

If Zimbabwe goes the route of encouraging FDI combined with a mineral regime that ensures the realisation of the seminal linkages ("riding the tiger") then it needs to reassess its indigenisation policy, which is currently a major constraint to attracting FDI, especially into lower return mineral projects (often more complex deposits), due to (a) the lack of certainty around the policy and (b) the ultimate quantum (51%). An indigenisation configuration that might finesse this could be to set the 10 year target at 25% and the 25 year target (i.e. on any Mining Lease renewal)[84] at 51%. This configuration would likely only have a marginal negative impact on attracting FDI into new mining projects, but would still ultimately "indigenise" the sector.

[80] McMahon 2012, p18
[81] Supported by ZANU PF and opposed in its current form by MDC
[82] ZCTU: Zimbabwe Congress of Trade Unions.
[83] VOA 19 Oct 2010, www.voazimbabwe.com
[84] Assuming Mining Leases are limited to 25 years or less (life of mine) as per the proposed amendments to the MMA.

INSTRUMENTS TO MAXIMISE THE FISCAL LINKAGES

Table 23: Summary of Fiscal Proposals

Fiscal Instrument	Current	Proposed	
CIT	25% (SMLs 15%)	25% (all)	RI
Royalties	1% - 15% (by mineral)	1-2% (all)	RI
RRT (APT)	0% (2 SMLs only - 42.5%)	50%; ROI > 20% (all)	RI
RRT advance	0%	30% @ MOODCAAA plus X %?	RI
Mineral Export Tax	0%	1-5% (if VA shown to be viable)	
Marketing	0.875% (ex gold)	0,875% (ex gold)	SI
Fiscal Stabilisation Fund	0	30% of RRT (locked offshore fund)	SI
National HRD levy	1% of payroll (Zimdef)	1% of payroll (Zimdef)	SI
Minerals HRD/R&D sp end	0%	5% of payroll	SI
Withholding Tax (foreign)	20%	15%	SI
Withholding Tax (local)	10%	10%	SI
Withholding tax – tax havens	20%	30%	SI
Retention Fees	Variable, high: $/claim	0	SI
Forensic Tax Self -Audit	none	5 yearly (Mine reven ue > $200mn, financed by Mine, under ZIMRA)	SI
Expl. License transfer CGT	0%	50%	SI
Indigenisation	51% by year 5?	25% by y ear 10; 51% by y ear 25	SI
VA: Value Addition; RI: Revenue Instrument; SI: Strategy Instrument			

3.7 BACKWARD LINKAGES

3.7.1 INTERNATIONAL BEST PRACTICE

Of all the mineral resources economic linkages opportunities, the backward linkages most probably represent the most potential, but they can also be difficult to realise. The mineral inputs (purchases) sector is dominated by capital goods (vehicles, rolling stock, plant, machinery, etc.), services (technological, engineering, analytical, financial, labour, etc.) and consumables (explosives, fuels, wear parts & spares, grinding media, reagents, etc.). In general, the backward linkages are knowledge intensive (engineering) which take time to build, but they are also the most "agile" in that international experience has shown that many enterprises that started out in the resources inputs sector were able to reinvent themselves in other sectors, due to being "engineer-intensive". Consequently, as a cluster, it is able to reduce dependence on exhaustible resources and form the nuclei of resource-independent industrialisation and job creation.

There are numerous factors impacting on the growth, competitiveness and sustainability of the upstream cluster including: "access to engineering and technical skills, access to skilled artisans, access to government incentives and finance for R&D for 'home-grown' firms, awareness of projects and business opportunities, lack of adequate business training and management, certification, high cost of imports, lack of resources to identify assistance programmes, lack of understanding of BEE, preferential relationships in the procurement process, and threat of inferior imports"[85]. However, experience from states that managed to make the transition from resource-based economies to industrialised economies with full employment (e.g. the Nordic states), strongly suggests that the most important instruments that facilitate the growth of the backward linkages industries are:

- HRD- production of engineers, scientists and technicians
- R&D- technology development, both state and private
- Access to capital

[85]Walker M, 2005: "Unpacking the Nature of Demand and Supply Relationships in the Mining Capital Goods and Services Cluster: The Case of PGMs", Corporate Strategy and Industrial Development (CSID) Research Programme, School of Economics and Business Sciences, University of the Witwatersrand

Figure 42: Finland- Mineral Inputs & Outputs Sector 2007

Source: Hernesniemi, H, Berg, B, Rantala, O & Suni P: Kalliosta Kullaksikummusta Klusteriksi: Suomen mineraaliklusterin vaikuttavuusselvitys, ETLA 2011

In 2011 The Research Institute of the Finnish Economy (ETLA) completed a major study[86] on the broader economic impact of their minerals sector and showed a 6:1 employment generation in other upstream and downstream industries, due to their well-developed mineral linkages. The Finnish mineral technology cluster employed as many people abroad as in Finland.

Table 24: Finland: Mineral cluster size ratios
(Mineraaliklusterin kokoa kuvaavia tunnuslukuja)

2009/2010	Mining opera-tions Services	Mining industry	Natural Stone Industry	Stone material industry	Mineral-technology companies	Mineral Cluster in Finland	Mineral-technology companies abroad	Mineral Cluster Total
Companies	25	36	306	294	104	765	..	
Locations	27	58	347	365	122	919	..	
Net sales, €mn	27	768*	212	492	1 115	2 614	2 447***	5 062
Employment TOTAL	368	3 725*	2 291	2 660	7 177	16 222	16 248	32 469
Company staff	202	2 044*	1 627	1 742	4 727	10 342	10 702***	21 043
Input Industries personnel ****	166	1 682	664	918	2 450	5 880	5 546	11 426
Industry products Exports €mn **		141	70	20	1 064	1 295	..	
Industry products Imports, €mn **		1 806	14	16	434	2 270	..	
Industry imports, €mn**		50	30			80		
Overall impact on employment ****	504	7 135	2 750	3 486	11 014	24 889	24 935	49 824
Effects of the total output ****	48	1 444	363	802	1 851	4 508	4 063	8 571

* ETLA: An assessment of companies since 2010, National Board of Customs ** 2010, *** Business and the National Board of Patents and Registration, data for 2009 and **** ETLA calculated using information from an intermediate product purchases and input -output model multiplier effects.

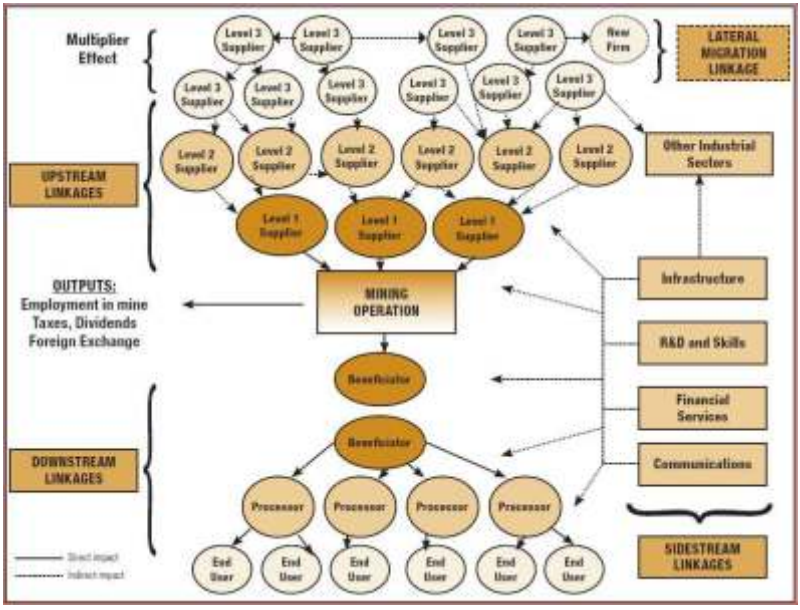
Source: Hernesniemi, H, Berg, B, Rantala, O & Suni P: Kalliosta Kullaksikummusta Klusteriksi: Suomen mineraaliklusterin vaikuttavuusselvitys, ETLA 2011 (Table 10 rough translation)

[86]Hernesniemi, H, Berg, B, Rantala, O & Suni P: Kalliosta Kullaksikummusta Klusteriksi: Suomen mineraaliklusterin vaikuttavuusselvitys, ETLA 2011

The Asian boom has given a second wind to Finnish mining, which had been in decline at earlier prices and cut-off grades. However, due to their well-developed mineral linkage industries, ETLA estimates total projected employment at more than 3 times the mining jobs, excluding foreign jobs.

There have been several similar linkages studies done for the minerals sector in both South America and southern Africa. A recent study (Lydall 2009) of the South African PGM[87] sector developed the backward linkages which are generic to most minerals.

Figure 43: South Africa-PGM Linkages

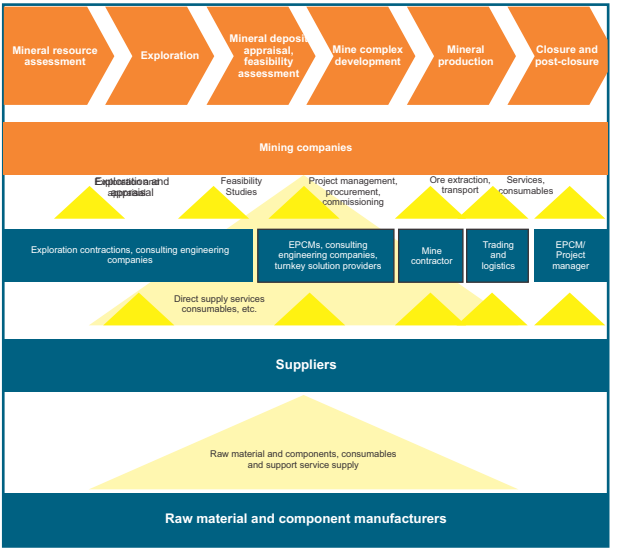


Source: Lydall, 2010. Cited in AU 2011 "Minerals and Africa's Development" p103[88]

The EPCM[89] firms are critical to optimising the initial (capex) linkages, which also impact on the potential ongoing (opex) linkages in terms of the technologies and processes selected. In addition, the Mozal (BHPB) linkages programme has indicated that the configuration of local sub-contracts is important to the success of developing local suppliers. A survey of mining supplier firms in Ekurhuleni (Gauteng, SA) indicated that the elevated price of steel by Arcelor-Mittal South Africa at the import parity price (IPP) was a major constraint to the growth of the cluster, as steel represented 30%-50% of their material costs. The mooted rehab of ZISCO by ESSAR needs to provide steel to this cluster at competitive export parity prices (EPPs). This should be built into any government contracts (leases) for critical feedstock suppliers.

[87]PGM: Platinum Group Metals
[88]African Union 2011, "Minerals and Africa's Development", AU/UNECA, Addis Ababa
[89]EPCM: Engineering, Procurement, Construction Management

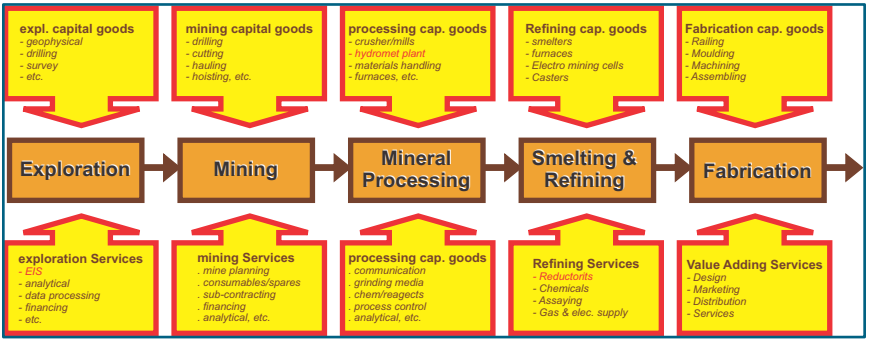
Figure 44: Mining Supply Chain Structure (exploration to closure)



Source: FIAS, 2009, "Supporting local procurement by the mining industrindustry (Mali)" www.fiesp.com.br/derex/oportunidades-negocios/pdf/mining%20industry1.pdf

The upstream cluster tends to be knowledge (engineer) intensive, especially the provision of capital goods (plant, equipment and machinery) and its after-market (spares). Consequently its development requires the concurrent development of technical skills (engineers, scientists, technicians).

Figure 45: Mining Pipeline Inputs: Capital goods and services



Source: Jourdan, 2008

Unlike other countries in the SADC region, Zimbabwe had a surprisingly developed mining inputs manufacturing sector, before the meltdown, supplying a wide range of mining capital goods, consumables and services. This is fast coming back due the booming minerals sector, but a significant proportion must however still be imported, particularly heavy equipment (capital goods). The major constraints facing the backward linkages sector appear to be:

- Reliable power supply (especially to foundries)
- Access to capital
- Skills
- Import tariffs for feedstocks
- Availability of scrap

3.7.2 ECONOMIES OF SCALE:

Although the Zimbabwean minerals sector constitutes a growing and significant large market for mineral inputs industries (backward linkages), the southern African region (SADC) has a rapidly growing minerals inputs market and significant future mineral potential. The viability of establishing supplier industries in Zimbabwe and elsewhere in the region would be substantially enhanced by the accession of Zimbabwe (and some other SADC states) into the SACU, with a review of the current agreement to facilitate investments in new capacity (products and services), distributed equitably across the region. In this regard a special facility to promote investment in the sub-continent should be investigated, possibly through a "regional development fund" funded through a proportion of the resource rents and donors, to invest in long-term human & physical infrastructure. A larger market could also facilitate competitive pricing of mineral-based intermediate products (and manufacturing jobs) as the small size and relative isolation (land-locked) of Zimbabwe will inevitably lead to monopoly pricing in certain sectors which could be overcome by increasing regional economic integration and competitive pricing within southern Africa (SADC).

3.7.3 INSTRUMENTS TO GROW THE UPSTREAM (BACKWARD) LINKAGES:

Mineral concession contracts (licenses/leases) should include clear milestones on local value addition in order to maximise the upstream linkages, failing which the concession/lease could be suspended and ultimately forfeited and re-concessioned. All HRD and technology development related to the exploitation of the mineral asset must be done in-country, where feasible, in order to facilitate further growth of the upstream cluster and related sectors. Investments in new upstream (supplier) industries, particularly mineral capital goods and R&D facilities, should form part of the evaluation matrix for all competitively concessioned mineral assets. In this regard the following interventions could be investigated:

1. Resolution of the power constraint through rehab of existing capacity, fast-tracking of expansion projects, new projects and imports;
2. Amend the MMA[90] to include upstream value addition (backward linkages: local content) as a clear objective of the Act and strengthen the Minister's power to include such conditions in the mining concession/lease. This could be done through the development of clear local content milestones (5, 10, 15 year targets) for all mining concession contracts (leases) in order to maximise local value addition. The concession contract (lease) should make it clear that failure to achieve the asset owner's targets could result in a suspension of the contract and that, after a rectification period, the asset will be re-concessioned (auctioned against developmental criteria). Once a new MMA is in place all current licenses should be revisted to include such local content milestones (and the new Act should cater for this);
3. Make local content commitments a bid variable with significant weighting for all new competitively tendered mineral concessions (auctions);
4. Consideration could be given to expanding the Indigenisation Law to cover purchases from indigenous suppliers[91], based on indigenous proportion of local value added in the goods or services supplied, rather than the total value of the goods or services, to facilitate backward linkages;
5. Task the Ministries of Industry and Commerce, of Economic Planning and Investment Promotion, of Mines and Mining Development and of Science and Technology with developing and implementing comprehensive industrial sub-sectoral strategies to grow the mineral upstream sectors (capital goods, services, consumables) including the use of instruments such as import tariffs, investment incentives, innovation stimuli, market access, access to finance, competitive feedstocks, etc.
6. Task the ZMDC with developing appropriate local mining capital goods, with the private sector and technology institutions, to overcome the technological challenges of the minerals sector and to improve health and safety of workers.
7. Establish a Minerals Sector Knowledge Fund in partnership with the industry, through an obligatory spend of 5% of payroll on local HRD and R&D, to rebuild backward linkages technology development capacity.

[90] MMA: Mines and Minerals Act
[91] The South African BEE supplier experience could be useful in this regard.

3.8 FORWARD LINKAGES

3.8.1 INTRODUCTION

The locational advantage created by the production of mining resources can provide a basis for establishing viable resource processing industries (beneficiation) and also providing feed-stocks for manufacturing and broader industrialisation. In this regard the resource contracts/leases need to provide incentives/disincentives for mineral resources downstream beneficiation. The first steps of beneficiation are often energy intensive (smelting) which is currently constrained by Zimbabwe's power shortages. Consideration should be given to importing low cost and sustainable hydro-power (HEP) from other SADC states, which have enormous potential (estimated at 200GW). These could be ring-fenced imports, thereby placing the supply risk with the beneficiation (mining/smelting) companies.

Box 3: The need for State Intervention on Beneficiation

One of the southern African beneficiation enigmas is manganese in South Africa where two-thirds of this high-grade resource is exported as crude ore, despite the next step (smelting to produce manganese ferro-alloys) being electricity intensive and South Africa having had low electricity prices over the last 30 years. However, the manganese export ore price was controlled by a global oligopoly of four companies which resulted in monopoly ore prices and very high returns for mining. Any downstream investments in capital intensive smelting would consequently have yielded lower returns on capital than selling ore at monopoly prices. In this way one distortion (monopoly pricing) led to another (lack of beneficiation) and this would be a good example of the necessity for state intervention to effect a correction through, for example, applying a correcting export tax on manganese ore exports, a resource rent tax on the excess profits or using infrastructure tariffs.

3.8.2 MINERAL FEEDSTOCKS

Value addition of minerals (forward linkages) can be tackled from a supply-side or a demand-side methodology. The former starts with what mineral resources the nation has and then develops strategies for their beneficiation, whilst the latter identifies what mineral inputs the economy needs for rapid job creation and then develops strategies for the cost-effective supply of those mineral inputs.

Given the overriding importance of creating jobs in Zimbabwe, the latter (domestic demand driven) methodology is used here, except for minerals with potential "producer power" (where southern Africa has a large share of global resources combined with relatively low global supply and demand elasticities).

Table 25: The Principal Mineral-Based Feedstocks into the Economy

Manufacturing:	Steel, polymers (from coal, Hc[93]s), base metals
Energy (electricity):	Coal, radioactive minerals, natural gas (and CBM, shale gas), limestone (emissions)
Infrastructure:	Steel, copper, cement (from limestone, gypsum, coal)
Agriculture:	Nitrogen (from coal, gas), phosphate, potassium, conditioners (e.g. limestone, dolomite, sulphides)
Pro ducer power:	Finally, where Zimbabwe has potential producer power, there could be increased downstream (beneficiation) potential: e.g. PGMs

3.8.3 STRATEGIC MINERALS DEMAND SECTORS

MINERALS FOR MANUFACTURING

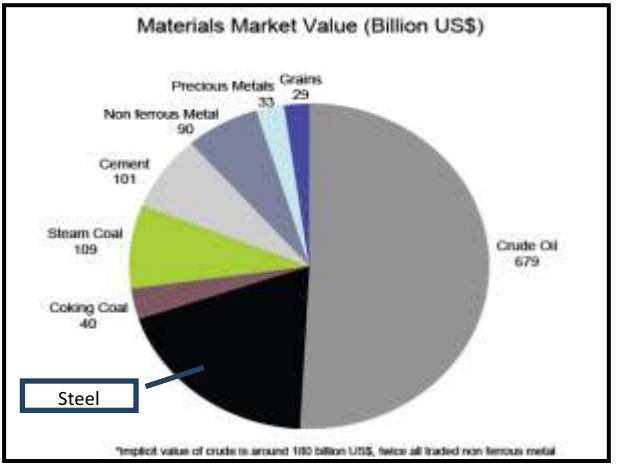
The manufacturing sector has the greatest potential for rapid job creation and the most important mineral-based inputs are steel (from iron ore and coking coal), polymers (from coal or CBM) and base metals (copper, zinc, lead, nickel,, etc.). Globally steel and polymers are by far and away the most important feedstocks into manufacturing at about 1.4Gtpa and 0.4 Gtpa respectively, compared to less than 0.2 Gtpa for all other metals combined.

[92]This generally appears to be the SA approach in "A Beneficiation Strategy For The Minerals Industry Of South Africa", DMR 2011
[93]HCs: Hydrocarbons

STEEL

By volume the global consumption of steel alone is around 10 times that of all other metals combined! By value it is more than double all other metals combined, including precious metals.

Figure 46: Global Materials Market



Steel: The main cost drivers of steel production are:

- Iron ore and scrap
- Reductants (coking coal, coal or gas)
- Energy (electricity)
- Capital

The table below gives costs for a typical blast furnace (BOF) steel plant using coking coal:

Table 26: Typical Costs for Steel Production, 2010

Item $/unit	Factor		Unit cost	Fixed	Variable	Total	%	Σ	Zim
Iron ore	1.435	t	62		88.97	88.97	23%		+++
ore transport	1.435	t	20		28.7	28.7	8%	31%	+++
Coking coal	0.519	t	128.5		66.69	66.69	18%		+++
C transport	0.519	t	19.5		10.12	10.12	3%	21%	++
Steel scrap	0.162	t	325		52.65	52.65	14%		~
Scrap delivery	0.162	t	5		0.81	0.81	0%	14%	~
Oxygen	80	m^3	0.08		6.40	6.40	2%		+
Ferroalloys	0.014	t	1400		19.60	19.60	5%		+++
Fluxes	0.521	t	30		15.63	15.63	4%	9%	++
Refractories	0.011	t	600		6.60	6.60	2%		++
Other costs	1		13	3.25	9.75	13	3%		~
By-products					-20.00	-20	-5%		~
Thermal energy,	-2.68	GJ	12.50		-33.50	-33.5	-9%		~
Electricity	0.122	MWh	150	2.75	15.56	18.3	5%	-4%	++
Labour	0.64	m-h	35	5.6	16.8	22.4	6%		+
Depreciation				40.00		40.00	11%		~
Interest				44.00		44.00	12%	23%	-
Total				95.6	284.78	380.37	100%		++

Source: derived from steelonthenet.com

The last column attempts to give Zimbabwe's relative global position. For most items Zimbabwe is in a relatively very strong position (+++) or strong position (++) due to having the requisite mineral resources (ore, coal, fluxes, alloys, etc.). Only on the cost of capital (interest) is Zimbabwe in a negative position, due to higher interest rates than most competitors (though an export plant would presumably be able to borrow at off-shore USD rates). However, on cost of transport of products to the global market, Zimbabwe would be in a negative position, though not for the regional (SADC) market. Nevertheless, overall, this would appear to indicate that steel could be produced very competitively in

Zimbabwe for the domestic and SADC markets, and possibly the world market.

However, steel is supplied into the domestic market at high imported prices. Recognising the seminal importance of low-cost manufacturing feedstocks, several developmental states established state utilities to supply low-cost (or cost-plus) steel into their manufacturing sector and thereby underpin their international competitiveness. Examples are POSCO in S.Korea[94], Japan Iron & Steel Company[95], CSC (Taiwan), Rautaruukki (Finland), NJA[96]-SSAB (Sweden) and Bao Steel in China.

The Mwanesi iron ore deposit could provide the resources not only for a world class steel plant, but also for a low logistics corridor to the global Market (see the case study in section 3.10.2). Zimbabwe also has significant resources of chromium and nickel, the key constituents of stainless steel. The possibility of establishing a Zimbabwean stainless steel slab plant based on local FeCr and Ni needs to be investigated, once the critical power shortage has been resolved[97].

POLYMERS

Polymers (plastics) are the second most important global feedstock into manufacturing at around 400Mtpa. The Zimbabwean plastics industry is still nascent but has the potential to grow provided that it can source competitively priced feedstocks and have cost-effective logistics to markets

Recognising the seminal importance of low-cost manufacturing feedstocks, several developing states established state utilities (refineries or oil companies) to supply low-cost (or cost-plus) polymer feedstocks into their manufacturing sector and thereby underpin their international competitiveness. Examples are CPDC (polymers) in Taiwan[98], Petronas in Malyasia, Sasol in SA and Petrobras in Brazil. Brazil has had a "Plastic Export Plan" since 2002 and the converter sector currently employs around 300k workers. This would equate to about 20k workers in Zimbabwe with ~6% of the Brazilian population, but a much lower GDP/capita.

Local polymer production could be based on coal gasification or CBM. Government needs to investigate the viability of establishing a world-scale facility based on these resources and attracting an investor or a JV partner with the requisite technologies and capital.

BASE METALS

The most important base metal feedstock into manufacturing (and infrastructure) is copper. Zimbabwe has very limited primary copper resources and modest copper associated with the PGM and nickel resources. Copper is mainly consumed in the electrical, construction, transport and capital goods sectors. Most copper alloy (brass) is generally obtained from scrap.

Copper was produced by MCM (mined out), BNC (scheduled to restart) and the Empress Base Metal Refinery operates on imported feed. It is currently extracted by the PGM miners as a by-product, but it leaves the country as a concentrate or matte to be refined in South Africa, despite the existence of several BMRs, including the BNC and the Zimplats BHP-Utah Selous BMR (on care and maintenance).

Government needs to commission an independent investigation on options for a BMR based on the PGM miner's feed followed by a Precious Metals Refinery to produce PGMs and gold. Both primary copper and scrap needs to be made available in the domestic market at competitive prices (EPP).

3.8.4 MINERALS FOR ENERGY

Adequate, reliable and low-cost energy is critical to the development of Zimbabwe, particularly the mineral forward linkage industries (beneficiation). The main minerals used in power generation are:

COAL

Coal is an important energy feedstock in Zimbabwe at nearly two-thirds of electricity supply capacity. The major power supply sources are the Hwange coal-fired thermal power station (920 MW capacity), and the Kariba South Bank hydro power station (750 MW capacity). There are also 3 minor coal fired stations with a combined capacity of 290 MW. Overall installed generation capacity is about 1960 MW but available capacity is about 1100 MW.

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[94]POSCO: The Pohang Iron and Steel Company; "With the strong Korean shipbuilding and automobile industry dependent on POSCO for steel, it has been seen as the bedrock of Korea's industrial development over the past 40 years." (www.en.wikipedia.org/wiki/POSCO).

[95]In 1934 the Japanese government merged The Imperial Works at Yawata with six leading private steelmakers--Wanishi, Kamaishi, Fuji, Kyushu, Toyo, and Mitsubishi & mdashø to form the Japan Iron & Steel Company, Ltd., which was about 80% owned by the government. (http://www.fundinguniverse.com/company-histories/Nippon-Steel-Corporation-Company-History.html).

[96]Norrbottens Järnverk- merged into SSAB, privatised 1989

[97]Electricity sales to the mining sector averaged about 1,500GWh/an for the period 1995 to 2006 then dropped below 1000GWh due the crisis and supply constraints.

[98]CPDC: China Petrochemical Development Corporation: Owned by the KMT, its principal activity is refining petroleum and petrochem production: chloral-alkali, phosphoric acid and other related chemicals and derivative products. Other activities include researching and developing chemical related products; trading, handling and selling garment, accessory, electric, book, stationery, automobile and household products, entertainment facilities; designing and selling computer software, handling information registration. (www.corporateinformation.com)

The Hwange thermal power plant presently produces between 400-550MW of power out of its 920 MW capacity due to regular failures of components in both the generation blocks as well as common auxiliary facilities and lack of spares for maintenance. Current national peak demand is estimated at between 1800 and 2100 MW resulting in power supply shortfalls of between 700 and 900 MW This situation has given rise to the ongoing power curtailment exercise whereby between 400 and 600 MW of national load is shed despite imports of about 300 MW.

Hwange Power Station (HPS) consumes over 2Mtpa tonnes of coal per annum. Hatch has completed a feasibility study for the HPS and Kariba Power Station extensions and technical bids are being sent out to pre-qualified contractors for appointment of successful contractors.[99]

Zimbabwe has been experiencing debilitating power shortages and the generation capacity needs to be substantially expanded to cater for national energy requirements and job creation, including IPPs[100] such as the proposed Sengwa power station (RioZim). Coal resources need to be prioritised for this need.

"We envisage Zimbabwe's net power consumption increasing by an annual average of 8.7% over our 10-year forecast period, from an estimated 12.64TWh in 2011 to 28.70TWh by 2021. Underlying the rise in energy consumption will be a steady increase in GDP, together with the continued expansion of Zimbabwe's population. Following an increase in 2011 real GDP of 9.3%, BMI forecasts average annual growth of 7.2% between 2011 and 2021. Meanwhile, the population is expected to rise from 12.8mn in 2011 to 14.3mn in 2016, increasing to 15.8mn in 2021."[101]

GAS

Zimbabwe's CBM and shale gas resources need to be assessed for possible power generation plants (CCGT) to diversify the energy mix and to meet projected demand and the putative Lupane CCGT[102] power station should be expedited as should an investigation on the viability of producing gas-based chemicals and fertilisers.

3.8.5 MINERALS FOR INFRASTRUCTURE

CEMENT (LIMESTONE, COAL, GYPSUM)

The Zimbabwean construction industry could be major job creator and growth in the construction industry has obvious implications for the local cement industry. By 2010, production capacity stood at around 800ktpa, though production is under 500ktpa, mainly due to power shortages. The main companies are PPC, Lafarge, Sino-Zimbabwe Cement Company (JV with the IDC) which started up in 2001 near Gweru.

These four players operate as a virtual cartel resulting in high cement prices with consequent negative impacts on the cost of construction. Cement is a vital feedstock for infrastructure provision and as such cement minerals (limestone, gypsum and coal) and the country has ample resources of calcareous rocks for the nation's construction needs. However the state needs to ensure that cement is supplied into the local market at the lowest possible prices (EPP).

OTHER INFRASTRUCTURE MINERALS

Steel (rebar, profiles, etc.) and copper (electrification) are dealt with under "Minerals for Manufacturing", above.

3.8.6 MINERALS FOR AGRICULTURE (NPK)

"Most of the soils in Zimbabwe are nutrient deficient and are degrading at a rapid rate. Large portions of Zimbabwe's soils are derived from granitic parent materials with nutrient-deficient sandy soils and low organic matter contents. The soils with 'greenstones' as parent material have a much higher inherent soil fertility. Zimbabwe's soils are continuously cropped but nutrient removal through harvesting without sufficient nutrient replenishment leads to a continuing decline in soil fertility. The two main limiting nutrients on Zimbabwe's soils are nitrogen and phosphorus."[103]

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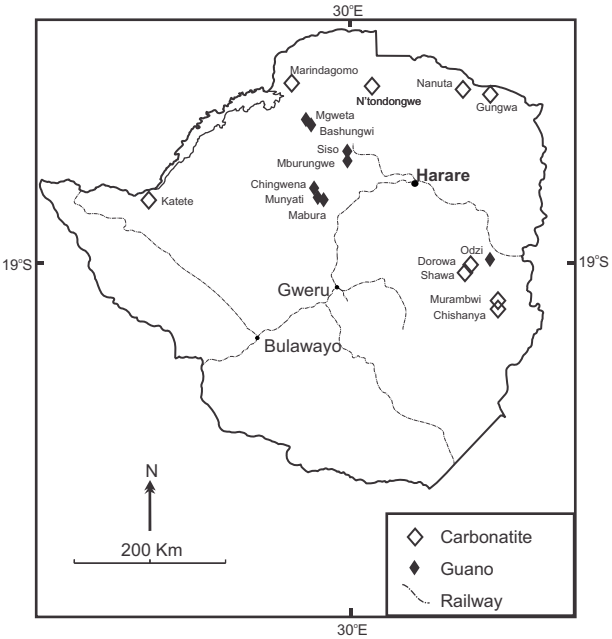
[99] ZESA website 2012
[100] IPP: Independent Power Producer
[101] Business Monitor International (BMI) 2012, Zimbabwe Power Report Q3 2012, www.researchandmarkets.com
[102] CCGT: Combined Cycle Gas Turbine
[103] Van Straaten, Peter 2002 "Rocks for Crops: Agrominerals of Sub-Saharan Africa", University of Guelph (www.uoguelph.ca/~geology/rocks_for_crops/56zimbabwe.PDF)

Figure 47: Carbonatite and Guano (cave) Deposits of Zimbabwe



Source: Van Straaten, 2002

Phosphate: There are four Mesozoic carbonatite deposits (Dorowa, Shawa, Chishanya, and Katete), but only Dorowa is mined for phosphates by Dorowa Minerals (Chemplex Corporation Ltd.) which produces phosphoric acid using pyrites from the Iron Duke Mine to make phosphatic fertilisers

Nitrogen: Sable Chemical Industries Ltd. (TA Holdings Ltd., 51%; Chemplex Corporation Ltd., 36%; Yara Zimbabwe) is the only producer, from the electrolysis of water to make ammonium nitrate, but production by this route is expensive and is severely curtailed by power shortages. Nitrogen is a critical input into agriculture which creates jobs in agriculture and agro-processing. The viability of producing nitrogenous fertilisers from coal gasification and/or CBM should be investigated.

Liming: Zimbabwe has over 200 known deposits/occurrence of calcareous rocks (limestone, dolomite, calcrete), many of which are used for conditioning of soils.

Given the lack of competition in fertiliser production, price abuse is inevitable (IPP) and the price of these critical inputs into downstream jobs should be regulated at EPP.

3.8.7 RESOURCES DOMINANCE

PGMS

Platinum is the only metal where southern Africa has a majority of world's resources (Zimbabwe and SA have close to 90% of global Pt resources) and which has relative supply and demand inelasticity. However, the bulk of the region's platinum production is beneficiated in the developed countries into catalysts and jewellery. In order for Zimbabwe to use this potential producer power to realise the backward and forward linkages opportunities, it requires influence over the marketing of its PGM assets.

In this regard the state should amend the Gold Trade Act to become a "Precious Metals Act" requiring state authorisation to market both gold and PGMs (Authorised Dealers). Platinum, like gold, represents a store of value (platinum bars/coins) and should accordingly fall under the same legislation. Marketing authorisation should then only be granted if the producers jointly commit to a reasonable plan for the refining of PGMs in Zimbabwe. A rough threshold for a basic refinery (Pt, Pd, Rh & Au) viability is apparently around 500,000oz per annum (~16tpa) of PGMs which has already been surpassed (2011: ~21tons).

Consideration should be given to the coordination of PGM marketing with South Africa in order to negotiate a PGM beneficiation plan with global customers that would see the establishment of downstream PGM value addition being

located in the two countries.

Figure 48: Platinum Exchange Traded Funds (EFTs)

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Source: www.platinum.matthey.com, accessed 02/11/11

Like gold, platinum has become a major store of wealth (investment instrument), especially in times of global uncertainty. "Total net investment demand for platinum was 650,000 oz in 2010... Investment demand for platinum in 2010 was largely a story of physically-backed ETFs, with total net fund holdings reaching over 1.2 million ounces for the first time in 2010. The unique combination of worldwide economic circumstances in 2010, a time of low interest rates and rising commodity prices, led to a flood of investment in ETFs."[104]

OTHER MAJOR GLOBAL RESOURCES (CHROMIUM, ASBESTOS)

Other minerals where Zimbabwe has a strong position in terms of global resources are chromium, chrysotile asbestos and to a lesser extent Lithium. However the supply and demand elasticities (substitutes, other accessible resources, etc.) are not as strong as for the PGMs. Consequently the state should commission an expert study to assess the potential producer power for each (including regional producers) by determining the relative supply elasticity (other resources, substitutes, etc.) and demand elasticity (price sensitivity, alternatives, etc.). The Ministries of Mining and Mining Development and Industry and Commerce could manage the study and develop a strategy to maximise the economic linkages, as per PGMs, based on the assessment.

3.8.8 INSTRUMENTS TO GROW THE DOWNSTREAM (FORWARD) LINKAGES:

1. Ensure competitive local prices (EPP) of strategic mineral feedstocks into manufacturing, infrastructure, energy, agriculture;
2. Resolve the debilitating power constraint through investments into power generation and through imports, including the temporary permitting of direct imports by beneficiators;
3. Harmonise mineral production and industrial strategies through strong coordination of Ministries of Mines and of Industry, of Agriculture, etc.
4. Introduce beneficiation milestones in mining leases at 5, 10, 15 and 20 years and make downstream value addition a bid variable for all new competitively tendered mineral concessions;
5. Impose a small export tariff (below 5%) on select raw mineral exports to encourage beneficiation--where independently shown to be viable. The viability of a PGM refinery should be assessed and, if positive, an export

[99]ZESA website 2012
[100]IPP: Independent Power Producer
[101]Business Monitor International (BMI) 2012, Zimbabwe Power Report Q3 2012, www.researchandmarkets.com
[102]CCGT: Combined Cycle Gas Turbine
[103]Van Straaten, Peter 2002 "Rocks for Crops: Agrominerals of Sub-Saharan Africa", University of Guelph (www.uoguelph.ca/~geology/rocks_for_crops/56zimbabwe.PDF)

tax on unrefined PGMs should be considered;
6. Establish new steel producers to sell at EPP (Mwanesi?) in the domestic market;
7. Ban all scrap metal exports (reserve for domestic use);
8. Exercise "Producer Power" in PGMs: amend the Gold Trade Act to also require PGM Authorised Dealers;
9. Enlarge the local market through equitable regional integration (SADC, SACU, CMA);
10. Support beneficiation technology and skills development (Knowledge Fund).

3.9 KNOWLEDGE LINKAGES

3.9.1 INTRODUCTION

A recent survey[105] of successful resource-based industrialisation states clearly shows that countries that successfully utilised their natural endowment for developmental purposes were successful at technical training (HRD) and technology development (R&D). These are a pre-requisite for taking advantage of the other minerals economic linkages opportunities, particularly the backward linkages. These countries included Sweden, Finland, China, Malaysia, Australia and, more recently, Chile and Brazil, though the last two are still well behind the Nordics. In order to effectively use mineral resources as drivers of development, adequate human and technology development is a necessary pre-condition.

HRD and R&D are seminal to unlocking the developmental potential of mineral resources (especially in the linkage industries) and virtually all the countries that have successfully used their resources to industrialise, invested heavily in technical HRD and R&D. Failure to attend to this will severely compromise and constrain all other resource-based development plans and interventions.

An important task of a state minerals company (ZMDC) should be to stimulate investment into human and technology development- Statoil in Norway has trained over 80,000 people since it was established in the '70s. Likewise Outokumpo (Finland) and LKAB (Sweden) fulfilled critical HRD and R&D mandates. The technology division of Outokumpu has been spun out into a separate company, Outotec, which has become a world leader in mineral processing and metallurgical technologies. In general there is a very strong correlation between establishing the mineral linkages sectors and concerted investment into technical HRD and technology development. Consequently a key mandate of ZMDC should be minerals HRD and R&D to underpin the mining industry in general and the upstream cluster in particular.

Education, and the knowledge it generates, is a key factor in development – it is crucial for economic and social progress everywhere. No country has managed to attain a high level of economic and social development without appropriate investments in good quality schooling and post-school education. Education impacts on economic development in many ways, through for example, its impact on labour productivity, poverty eradication, technology, and health.

There is a strong correlation between knowledge and economic performance in general, and knowledge and (economic) sectorial performance in particular. Investment in technical skills at both the schooling and post-schooling levels is critical for the optimal performance, for example, of the Zimbabwean minerals sector and linkage industries. However, the current state of education and training in Zimbabwe is not conducive to knowledge generation and the development of the appropriate technical skills necessary for growth in key sectors such as mining and its important backward and forward linkages sectors. The education and training challenge comprises both quantitative and qualitative dimensions.

Table 27: Zimbabwe- UNICEF Education Indicators

Indicator	Score
Youth (15-24 years) literacy rate (%), 2005-2010*, male	98
Youth (15-24 years) literacy rate (%), 2005-2010*, female	99
Number per 100 population , 2010, mobile phones	60
Number per 100 population , 2010, Internet users	12
Primary school participation, Net attendance ratio (%), 2005-2010*, male	90
Primary school participation, Net attendance ratio (%), 2005-2010*, female	92
Primary school participation, Survival rate to last primary grade (%) , 2005-2010*, survey data	82
Secondary school participation, Net attendance ratio (%), 2005-2010*, male	45
Secondary school participation, Net attendance ratio (%), 2005-2010*, female	45

Source: UNICEF, 2010, www.unicef.org/infobycountry/zimbabwe_statistics.html

[105] ANC 2012 "Maximising the developmental impact of the people`s mineral assets: State Intervention in the Minerals Sector (SIMS)", http://www.anc.org.za/list.php?t=Reports&y=2012

Although literacy rates and primary school attendance are high, only 45% of children attend high school (Table 27) and only 1% reaches the SACMEQ[106] Level 8 in mathematics competency, below the regional average (1.2%). More disturbing is that only 0.1% of rural children reach Level 8 mathematics competency (Table 28) Consequently a portion of mineral rents needs to be invested in school mathematics and science education, both in the mining areas through CSI[107] and nationally through the fiscus. Due to the economic crisis, there has been a massive exodus of Zimbabwean educators who are teaching in many SADC states and beyond. A strategy needs to be developed to re-attract this valuable diaspora, possibly through engaging a competent head-hunting agency to locate them, and a package of incentives to bring them back (subsidised relocation costs, placements, remuneration, etc.)

Table 28: Zimbabwe Pupil Mathematics SACMEQ 2007

	Pupil Match Score		Percentages of pupil reaching mathematics competency level															
			Level 1		Level 2		Level 3		Level 4		Level 5		Level 6		Level 7		Level 8	
Subgroup	**Mean**	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Boys	**520.8**	5.80	3.6	0.63	24.6	2.17	28.0	1.60	22.1	1.35	10.9	1.06	6.6	0.93	2.9	0.84	1.3	0.43
Girls	**519.0**	5.25	3.6	0.69	21.7	1.58	32.8	1.67	23.0	1.32	9.0	0.97	7.1	1.05	2.2	0.52	0.8	0.28
Rural	**492.1**	4.10	4.8	0.62	29.3	1.68	34.8	1.39	20.7	1.17	6.4	0.64	2.9	0.60	1.0	0.59	0.1	0.05
Urban	**589.6**	6.57	0.5	0.20	7.0	1.20	20.3	1.88	27.3	1.45	18.3	1.36	16.7	1.66	6.3	1.05	3.6	0.78
Low SES (Bottom 25%)	**487.8**	5.86	5.9	1.02	31.6	2.41	32.9	2.26	19.8	1.68	5.5	0.95	3.1	0.93	1.2	0.86	0.0	0.00
Low SES (Top 25%)	**588.8**	6.99	0.4	0.25	8.7	1.35	18.6	1.94	26.8	1.83	19.2	1.63	16.2	1.73	6.9	1.16	3.2	0.93
Overall Zimbabwe	**519.8**	4.98	3.6	0.46	23.0	1.49	30.7	1.21	22.6	0.94	9.8	0.74	6.8	0.85	2.5	1.56	1.0	0.30
Overall SACMEQ	**509.7**	1.16	3.9	0.12	27.5	0.37	31.6	0.28	20.2	0.27	8.3	0.18	5.6	0.17	1.7	0.09	1.2	0.10

Source: Southern and East African Consortium for Monitoring Education Quality, 2010, SACMEC III Working Document #1, www.sacmeq.org

HIGHER EDUCATION AND ECONOMIC GROWTH

Higher education is an important form of investment in human capital development. In fact, it can be regarded as a high level or a specialized form of human capital, contribution of which to economic growth is very significant. The contribution of higher education to development can be varied: it helps in the rapid industrialization of the economy, by providing individuals with professional, technical, and managerial skills. In the present context of transformation of nations into knowledge economies and knowledge societies, higher education provides not just educated workers, but knowledge workers to the growth of the economy. It creates attitudes, and makes possible attitudinal changes necessary for the socialisation of the individuals and the modernization and overall transformation of the societies. Fourthly, and probably most importantly, higher education helps, through teaching and research in the creation, absorption and dissemination of knowledge. Higher education also helps in the formation of a strong nation-state and at the same time helps in globalization. Lastly, higher education allows people to enjoy an enhanced 'life of mind' offering the wider society both cultural and political benefits.

HIGHER EDUCATION AND TECHNOLOGICAL ABSORPTION

In a rapidly technologically changing world, technology makes a significant difference to the economic growth of nations. UNDP (2001) developed a technology achievement index (TAI), based on the degree of creation of technology in a given economy, the extent of diffusion of old and recent innovations, and human skills. It is clear from this body of work that the level of achievement in technology critically depends upon the level of higher education in a given economy. After all, it is higher education and research that help in developing new technology; and it is higher education and research that contributes to innovations and in their diffusion. Consequently one can expect a very strong effect of higher education on the development of technology in any society. In fact, the level of achievement in technology may be a close indicator of economic growth itself. Most countries with high enrolment ratios in higher education became 'leaders' in technology, with high levels of achievement in technology, as shown in the table below. The converse is also true: a large number of countries with low enrolment ratios (say less than ten percent) are 'marginalized' in the area of technology. Those with medium level of enrolment ratios, nearly 20 percent, like Singapore and Hong Kong have indeed become 'potential leaders' in technology (Table 29 below).

Table 29: Higher Education (GER) and Technology (Technology Achievement Index)

Gross Enrolment Ratio (GER)	High TAI (>0.5)	Medium TAI (0.4 -0.5)	Low TAI (<0.4)
High (>20)	New Zealand, Korea, Australia, Israel, Japan		Philippines
Medium (11-20)	Singapore	Hong Kong	Thailand, Cyprus, Syria
Low (<10)			Iran, Indonesia, Malaysia, India, Sri Lanka, Nepal, China, Pakistan, Zimbabwe

GER: Gross Enrolment Ratio; TAI: Technology Achievement Index
Source: ANC, 2012

[106] SACMEQ: Southern and East African Consortium for Monitoring Education Quality
[107] CSI: Corporate Social Investment

A few countries like Philippines and Thailand with medium and high levels of enrolment ratios are classified by the UNDP as "dynamic leaders". The rest who did not expand their higher education systems well, are indeed 'marginalized.' There is not a single country with a low enrolment ratio (less than 10 percent) in higher education which has achieved high or medium level of achievement in the technology index.

The relationship between higher education and technology could be shown statistically as well. The simple coefficient of correlation between enrolment ratio in higher education and TAI in the Asia and the Pacific countries is as high as 0.8 and that between technology and higher education attainment it is 0.65. Though the number of observations is small, the simple regression equations estimated show a very strong and statistically significant effect of higher education on the level of achievement of technology.

THE ZIMBABWE BRAIN DRAIN

There have been two "brain drains" (loss of skills) from Zimbabwe: The first was mainly European settlers following liberation in 1980 when an estimated 50k to 60k left because they could not adjust to the changed political circumstances. The second phase was from 1999 to 2009 when it is estimated that around 800k left[108] mainly due to the economic crisis. "The Zimbabwe Chamber of Mines estimates that more than half the industry's skilled personnel emigrated from the country in 2007 and that in early 2008 there were 1116 vacancies for professional and technical staff."[109]

Table 30: Official Emigrants by country of destination, 2002–2005n

Destination	2002	2003	2004	2005
AFRICA	6,307	6,330	7,079	6,256
Botswana	2,286	2,193	2,889	1,524
Kenya	66	102	109	110
Malawi	374	1,076	496	687
Mozambique	1,372	1,167	1,751	1,390
South Africa	1,741	87	61	1,502
Swaziland	12	15	28	15
Tanzania	23	701	805	81
Zambia	274	718	577	540
Other	159	271	363	407
AMERICA	231	292	366	431
ASIA	92	103	163	221
EUROPE	1,471	1,584	3,597	3,758
Other	84	117	100	122

Source: CSO/Zimstat in IOM, 2010

However, the official (CSO/Zimstat) data "...give an extremely distorted and underestimated image of Zimbabwean emigration patterns" and "...despite the great variety of estimates, a range of statistical sources suggest that there is a maximum of 1.5 million Zimbabweans in South Africa, including regular and irregular migrants."[110]

Table 31: Positive and Negative Effects of Migration from Zimbabwe

Positive Effects	Negative Effects
-Availability to emigrant workers of opportunities that are not available at home -Inflow of remittances -Technology transfers and investments -Integration into global markets	-Net decrease in human capital stock, especially those with valuable professional experience -Loss of heavy investments in subsidized education -Reduced quality of essential health and education services -Tax revenue declines

Source: IOM, 2010

Although there are positive effects of immigration (Table 31), they are overwhelmed by the negative effects on growth and development due to the depletion of human capital stock.

Several studies indicate that two-thirds of Zimbabweans abroad intended to return to settle permanently (skilled & unskilled migrants)[111]. However "...skilled migrants might find it easier to integrate into the host country and be less unwilling to resettle even if political and economic conditions were to change".

[108] IOM 2010 "Migration in Zimbabwe. A Country Profile 2009", International Organization for Migration (IOM), http://publications.iom.int/bookstore/free/mp_zimbabwe.pdf
[109] Hawkins 2009
[110] IOM & Zimstat 2010 "Migration in Zimbabwe. A Country Profile 2009", p37, International Organization for Migration (IOM), http://publications.iom.int/bookstore/free/mp_zimbabwe.pdf
[111] Jonathan Crush, Abel Chikanda, and Godfrey Tawodzera 2012 "The Third Wave: Mixed Migration from Zimbabwe to South Africa", SAMP, Southern African Research Centre, Queen's University, Canada (www.queensu.ca/samp/sampresources/samppublications/policyseries/Acrobat59.pdf)

Box 4: Minerals Sector Skills Crisis

"The number of university graduates needed in mining disciplines is estimated at between 480 and 550, but the maximum capacity of mining-related departments at the University of Zimbabwe is 124 students per year, meaning that it will take 4 to 5 years to supply existing needs, let alone providing for the anticipated recovery and growth of the industry in a post-crisis environment.

"In the longer term," the report says "the flow of graduate learners from the University of Zimbabwe is at risk due to the serious depletion of academic staff in mining engineering, metallurgical engineering, electrical engineering, geology, survey and chemistry. Only five geologists were expected to graduate in 2007 and none for the subsequent 4 years as the department is being restructured." (Viewing 2007, page 56)

Vacancies for academics at the University of Zimbabwe have reached such a stage that courses in mining, metallurgical and electrical engineering as well as in geology and survey are at risk. The vacancy rate in the Faculty of Engineering in mid-2007 was 66 percent while in the Geology and Chemistry departments of the Faculty of Science the vacancy rate was 62 percent. In Geology only three academics were in a post out of an establishment of 16, while the departments of mining engineering, metallurgy and survey had a total of 5 people in post against an establishment of 35.

The Zimbabwe School of Mines (ZSM) in Bulawayo was established to train selected employees sponsored by mining companies on a block release basis. The School has an annual capacity of 160 students annually who are prepared for the Mine Managers Certificate of Competency, but both trainers and examiners are in short supply.

A survey undertaken by the Government – The Zimbabwe National Human Resources Survey 2006 – concluded that as many as 70 percent of 1519 graduates surveyed indicated a wish to emigrate – 76 percent for graduates and 86 percent for postgraduates. The University itself estimates that of 2800 students who graduate each year only about 700 wish to stay in Zimbabwe." (Hawkins 2009 p18)

One of the contributors to the Finnish economic success has been ascribed to the over-production of engineers in the 50s and 60s which led to some immigration and the acquisition of world-class know-how abroad that contributed the rapid technology development and growth when they returned home in the 70s and 80s. Zimbabweans abroad could provide a similar stimulus if they can be enticed to return home.

GRADUATE HOLDING STRATEGIES

Due to the economic crisis from 1999 to 2009, Zimbabwe lost a major proportion of its skilled workforce. In the light of these losses and an education system that is not producing the requisite skills, the number of so-called scarce skills in the economy increased dramatically.

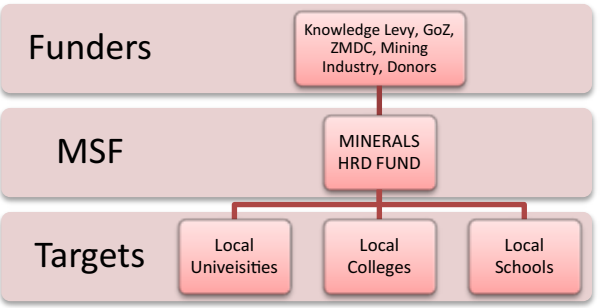
The training of engineers and scientists is heavily subsidised by the state and in order to discourage the exit of these skills, consideration should be given to converting the state subsidy into a notional loan that will be written off over 10 years of employment in Zimbabwe. The "loan" (difference between full costs and fees paid) should be paid off like a bond at prime over 10 years by working in Zimbabwe. If graduates decide to emigrate before 10 years, they will be liable for the full outstanding portion of the loan (i'e, the loan converts from notional to real).

MINERALS SKILLS FUND

Consideration should be given to the setting up of a Minerals Skills Fund (MSF) as a PPP with industry and tertiary education institutions in combination with a n obligatory corporate HRD spend of 5% of pay-roll (ex-Zimdef), as a Mining Lease condition. Contributions to the MSF would then qualify towards the obligatory HRD spend. A "normal" corporate spend on HRD to renew the corporate human asset base is currently ~5% of pay-roll: On average the SA mining industry already spends around 5% of pay-roll on HRD and skilling[112] (excluding the 1% Skills Levy), consequently this obligation would only be a burden for below average companies that presumably rely on poaching skills from responsible companies.

[112]Personal communication with SA Chamber of Mines, Sept 2012.

Figure 49: Possible Minerals Skills Fund (MSF) Structure



3.9.2 RESEARCH AND DEVELOPMENT (R&D)

There is a correlation between a country's investment in technology development and its economic performance. A recent study on mineral resource based industrialisation (ANC 2012) found that there was an almost total correlation between successful industrialisation and elevated spending on technology development (above 2% of GDP).

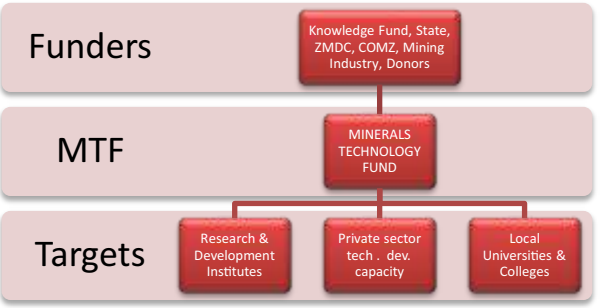
Zimbabwe needs R&D capacity in minerals technologies to enable it to take advantage of the backward and forward mineral linkages opportunities, to mine more resources, and to deal with technical health and safety challenges. "It creates the tools and techniques to liberate value from increasingly difficult-to-mine ore bodies; and provides the environment where the high-level technical skills can be created that will greatly increase our ability to take full advantage of our mineral resources."[113]

Apart from universities, mineral research institutions (e.g. IMR and GML) are also important in addressing the challenge of high-level skills. Not only should they undertake fundamental and applied research, they also provide the training ground for the development of very high-level engineering skills. Both the IMR and the GML need to be re-capacitated and the development of a mining technologies development capacity needs to be considered for the Bulawayo School of Mines (BSM).

3.9.3 Investing in the Development of Minerals R&D

The Zimbabwean mineral technology needs and capacity should be surveyed, especially the needs of local mining suppliers, in order to develop a national minerals technology strategy and to prioritise technology development projects, which could also be funded through the Minerals Knowledge Fund (levy on payroll). Such a fund could also incentivised through a concessionary tax write-off (>100%) on local R&D expenditure and a small percentage of the skills levy could be allocated to post-grad and post-doc research projects. In this regard the establishment of a dedicated Minerals Technology Fund (MTF) could be considered, funded by Knowledge Fund, State, ZMDC, COMZ, mining companies and donors.

Figure 50: Possible Minerals Technology Fund (MTF) Structure



[113]Maloney (2007)

3.9.4 INSTRUMENTS TO GROW THE KNOWLEDGE (SKILLS/R&D) LINKAGES:

If Zimbabwe is to use its mineral resources to underpin growth and development it needs to regain its lost skills, rapidly develop new skills and rebuild its minerals technology development capacity. Some proposals in this regard include:

1) The reinforcement of the National Migration Management and Diaspora Policy to include the location of skilled Zimbabweans in the diaspora and instruments to facilitate their return such as assisted relocation and remuneration subventions for critical scarce skills;

2) Investigate the conversion of tertiary state training costs into notional loan to be worked off over 15 years by working in-country (coverts to real loan if graduate exits before year 15);

3) The introduction of minimum minerals knowledge corporate spending requirement of 5% of payroll to fund skills formation for the minerals sector and back/forward linkage industries, as well as local technology development. The South African Mining Charter[114] targets HRD expenditure of 5% of pay-roll by 2014. Including the 1% National Skills Levy, this comes to 6% of the company's pay-roll;

4) Rebuild mineral technology development institutions (IMR, GML, BSM, Universities, et al);

5) Use of a portion of the proposed RRT to fund:

   a. The training and remuneration of Maths and Science specialists to assist in Maths and Science Education in primary schools across the country where such need is identified. The precise mechanism for implementing this should be worked out in consultation with the Ministry of Education,

   b. Grants/loans for Engineering and Science students to be administered through the Universities. Tertiary training should be free in critical technical areas;

   c. Financial support to Engineering Faculties based on the number of undergraduate students graduating and registering with the Engineering Council Of Zimbabwe (ECZ), as well as Financial support to Engineering Faculties for post-graduate studies.

   d. Grants for Engineering and Technician "learnerships".

6) However, it may be advisable to first carry out a survey of the critical minerals technical skills needs and to then develop a HRD strategy with government. Such a plan might best be resourced by establishing a National Minerals Skills Fund, together with the GoZ and the mining industry, funded in part by the Mineral Knowledge Corporate Spend (5% of payroll).

7) Investigate the establishment of a dedicated Minerals Technology Fund (MTF) as a PPP with the mining industry, pedagogical institutions and state enterprises (ZMDC) and institutions.

3.10 SPATIAL LINKAGES

Mining is one of the few economic activities that could have strong spatial (infrastructure) links to both its immediate surroundings and the local, provincial, national and regional economies, if appropriately configured. What is special about minerals is that they require a diverse set of infrastructure to support them (transport, power, water, etc.). An important aspect of mineral development impact arises from the fact that the spatial linkages that it creates first with its immediate surroundings and then with the broader economy, tend to be strong. Like most minerals economies, the spatial linkages that the minerals industry has created in Zimbabwe traverse the infrastructural spectrum. Through its demand for transportation, energy, water, and social infrastructure for the workers who work in the mines, the industry has had an impact on Zimbabwe's economy that dates back from the BSAC invasion in 1890.

Mining activities always require a significant investments in infrastructure before the actual mining takes place especially in a context where deposits to be mined are located in remote areas lacking infrastructure. It is for this reason that minerals are usually regarded as a catalyst of development in as far as it can provide the basic infrastructure (road, ports ,rail, power and water) that can open up previously isolated areas or enhance existing areas of low economic activity. Zimbabwe has a history of infrastructural development that has greatly been influenced by the mining industry. This can play an important role in opening up regions for other economic activities with the objective of creating sustainable local economies, post mineral depletion.

3.10.1 INFRASTRUCTURE

Zimbabwe used to have what was probably the best physical infrastructure in the whole of sub-Saharan Africa outside of South Africa. It had an excellent paved and unpaved road network covering most of the country and all of the main

[114] www.dmr.gov.za/mining-charter.html

mining areas. The railway network is well developed and most major mines are linked by rail, but over the last two decades the National Railways of Zimbabwe (NRZ) has displayed an increasing inability to maintain the system and handle the rail traffic, particularly the domestic distribution of coal.

Before 1976 most mineral exports were via the Mozambican ports of Beira and Maputo, particularly the latter, but in March 1976 the Mozambican government closed these two routes in compliance with the then UN sanctions against the rebel settler regime and all mineral trade was routed through South African ports. After independence in 1980 minerals once again started flowing through the Mozambican routes but by 1984 these were once again effectively closed due to sabotage by the South African special forces and/or their surrogate, Renamo. They were reopened through the intervention of Zimbabwean troops in the second half of the eighties, but unfortunately the port of Beira's ability to handle bulk mineral cargo is limited, both in terms of the port's handling facilities and the limited tonnage of vessels that can enter the port. Maputo (Matola) is more suited for mineral exports, but the virtual collapse of NRZ has resulted in most mineral exports being trucked to South Africa. They future of bulk mineral development for export (e.g. iron ore and coal) will critically depend on establishing heavy haul rail corridors to the closest coast (Mozambique) that could have a much wider impact on the national economy (SDI), by significantly lowering the logistics cost for all products, possibly to as low as $6/t, from the centre of the country.

The Zimbabwe Electricity Supply Authority (ZESA) has an electricity grid over most of the country including all of the major mines, but has it has been vandalised by thieves (for copper and aluminium). ZESA has failed to maintain generating capacity resulting in regular power outages, but tenders have reportedly closed for the construction of the new generation capacity at Kariba South Power Station. Sino Hydro is apparently the only bidder for the project. The Hwange power station will also be expanded by 600MW. These development projects will add 900MW to Zimbabwe's capacity by 2016. In addition ZESA is planning a 350MW gas-fired station based on CBM (Coal Bed Methane) and a tender for the quantification the Lupane CBM gas has reportedly gone out. It also plans to invest in a 30MW hydropower plant at Gairezi and in $500 million transmission integration project. ZESA's main constraint is in raising capital for its $2 billion new build, given that the state is virtually bankrupt with a reported $10 billion sovereign debt burden.

The Cabora Bassa hydro power station in Mozambique, is linked to the Zimbabwean grid at Bindura and several mines have direct supply from HCB (Hidroelectrica Cabora Bassa). ZESA imports from HCB are set to resume with the reduction of the HCB debt from $150 million to $3 million and power imports are set to increase from the current 50MW to 350MW. In addition, the new coal projects in Tete Province will reportedly also produce 1-2GW of thermal power from the lower grade overburden coal, which could be available to Zimbabwe.

Zimbabwe and Zambia are also working on a joint 1 650MW Batoka Gorge project below Vic Falls which is set for completion in 2019 after Zimbabwe agreed to clear its $71 million legacy debt with Zambia by end of March 2014.

Currently there is a generation capacity shortfall of 750MW, which will reportedly be reduced to 480MW in 2013 and 445MW in 2014 after new projects are come on stream. The average national power production is about 1400MW against demand of around 2200MW.

Zimbabwe used to have an excellent financial sector boasting several commercial banks, merchant banks, a discount house, and a thriving stock exchange. This is rapidly being rebuilt after the hyperinflation damage, but there is a general lack of liquidity in the economy which needs to be resolved by sorting out the sovereign debt (HIPC process) and recapitalising the Reserve Bank to underpin the banking sector. The proposed RRT 30% advances could be used to this end.

Fixed line telecommunications needs to be rehabilitated after years of under-investment. However, wireless communications have improved with the entry of two mobile telephony operators, but data speeds and coverage are still poor.

An elucidation of how the potential of the mineral spatial linkages could have a much wider impact on national growth and development is perhaps best done through the following case study, on a potential development corridor based on the Mwanesi Range iron resources:

3.10.2 CASE STUDY: THE PUTATIVE MWANESI DEVELOPMENT CORRIDOR AS A SPACIAL DEVELOPMENT INITIATIVE (SDI)

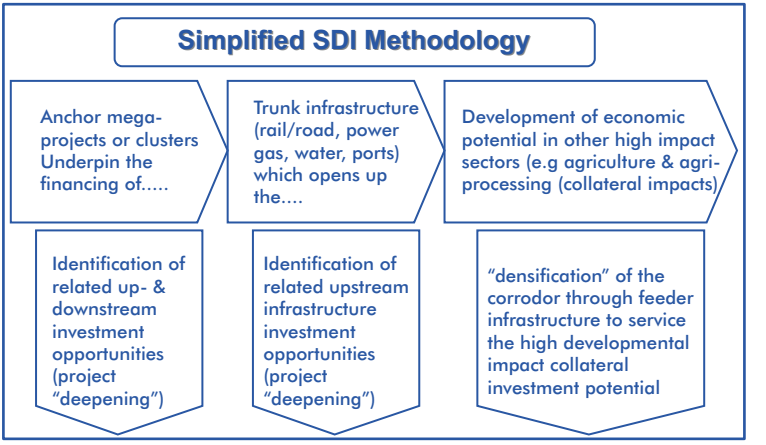
The Mwanesi Range NE of Chivhu contains large iron ore resources over a 60km banded ironstone formation[115] in the shape of a compressed letter "C". Resources are estimated at 33 billion tonnes[116] grading at about 40% Fe, necessitating upgrading to a saleable product (~65% Fe).

[115]Banded Ironstone Formation: alternating thin layers of iron ore & silica/shale
[116]Worst 1962, "The Geology of the Mwanesi Range", Zimbabwe Geological Survey Bulletin No. 54

Figure 51: Mwanezi Range Location

Initial indications are that this resource could constitute an "anchor project" for a Development Corridor (DC) to the Mozambican coast (Port of Beira or a new port north of Beira) that could catalyse numerous other developments along the corridor in sectors such as agriculture & agro-processing, forestry & wood products, manufacturing, etc

Figure 52: SDI Methodology



Source: Jourdan, 2010

Such a DC could also dramatically lower Zimbabwe's logistics costs to the world and significantly increase its economic competitiveness. However, in order to optimise the developmental impact of this seemingly significant mineral asset, the seminal economic linkages need to be maximised through a well-crafted international tender of the concession to identify a partner that will not only develop the mine, but, more importantly, use the asset to catalyse wider development across the economy.

Figure 53: PUTATIVE MWANESI DEVELOPMENT CORRIDOR

This project could underpin a massive boost to the Zimbabwean economy, if the concession is carefully configured to maximise the potential wide-ranging economic linkages:

3.10.2.1 FISCAL LINKAGES

The state tax take over the life of the concession should by the most important bid element – The bidders could bid up the Resource Rent Tax (RRT) from a base rate of 50%, or a combination of the RRT rate and the royalty rate. Mining and upgrading costs should be about $12-$15/t and transport costs to the coast could be as low as $15/t, resulting in an FoB coastal cost of ~$30/t. Assuming a long-term iron ore fines price of ~$70/t, this would result in a profit of ~$40/t once the capex has been amortised. Consequently a 50% RRT could yield around $1200 million per annum for a production rate of 60 Mtpa, once "steady-state" is reached (after capex is paid). There would also be numerous other fiscal revenues from corporate income tax, royalties, tariffs, PAYE, etc., both from the project, the linkages projects and economic activity catalysed by the project (collateral impacts).

3.10.2.2 FORWARD LINKAGES

Iron/steel is by far the most important feedstock into manufacturing globally and Mwanesi could underpin the revival of Zisco at Redcliff and/or a new steel flat products plant located either at Redcliff or Mwanesi, as well as a possible gas-based reduction plant (iron/steel) at the coast in Mozambique.[117] The availability of iron/steel in the domestic market at export parity pricing[118] could in turn underpin the revival of Zimbabwean manufacturing. Consequently, a second bid item should be to bid up investments in downstream iron/steel (value addition).

3.10.2.3 BACKWARD LINKAGES

The Mwanesi mega mine, steel plant/s and infrastructure will create a large new market for a wide range of inputs, including capital goods (plant & machinery), consumables and services. All of these present potential investment opportunities. The third bid item should be to bid up investment in upstream industries/activities by bidding up the Zimbabwean local content by year 5, 10, 15, and 20.

[117] However, the concession should stipulate that ore must be made available to local beneficiators at a cost plus price (cost plus a reasonable return)
[118] EPP: export parity price = international price less the logistics costs = competitive price.

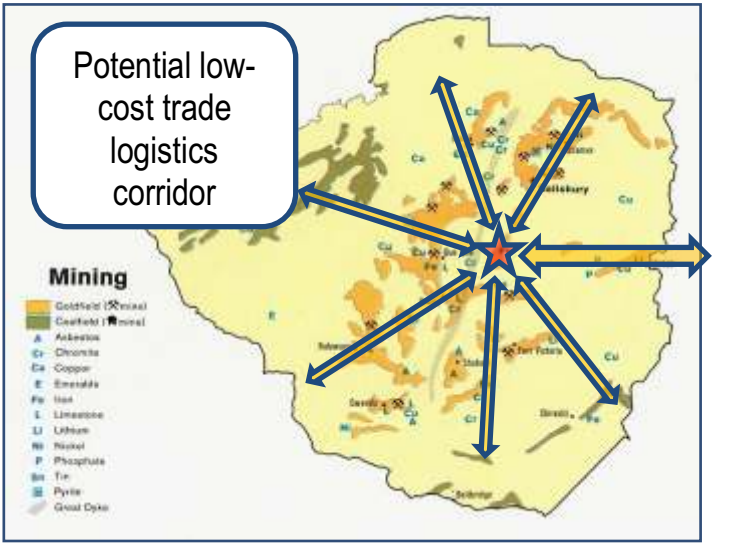
3.10.2.4 KNOWLEDGE LINKAGES

This project should stimulate massive development of local skills and technology capacity which should in turn facilitate the backward & forward linkages. Consequently the fourth biddable element should be the annual investment in local human resource development and R&D.

3.10.2.5 SPATIAL LINKAGES

In the longer term the spatial linkages emanating from this project could have the largest impact on the Zimbabwean economy, through the provision of a low-cost logistics connection to the global economy. This could underpin widespread economic activity across the economy. However these spatial linkages will not be realised unless configured and facilitated through the establishment of a SDI programme with Mozambique, to maximise the collateral economic impacts to transform a resources-corridor into a development corridor. Consequently the concession should stipulate third party access at non-discriminatory prices to all concession infrastructure, as well as obligatory over-capacity, to cater for the rest of the economy. It should also stipulate that an ore slurry pipeline to the coast will only be permitted once a low-cost new rail link has been established, to maximise the collateral impact (3rd party users) of the transport infrastructure. The degree of excess infrastructure capacity could also be a biddable tender item.

Figure 54: National gateway to the World?



3.10.2.6 WAY FORWARD

1. The current Essar agreement should be restricted to the rehabilitation of Zisco with sufficient ore resources to realise this (possibly the enriched high grade haematite deposits). The Buchwa Iron Mining Company (Bimco) could be transferred to the ZMDC who could then undertake this mega concession, with other government departments & agencies, through public tender to select an international partner that offers the highest bid in terms of realising the economic linkages (above) and consequent growth and development.
2. The Government of Zimbabwe should invite the Government of Mozambique to "partner" with Zimbabwe on the concession, especially as regards the transport corridor, new port and terminal and the back-of-port facilities, including a possible pelletising plant and second iron/steel plant, with a view to a single infrastructure concessioner (NRZ & CFM?) to ensure seamless logistics operations.
3. The two governments should appoint a Joint Project Team (JPT) to coordinate the selection of the best possible investment partner/consortium.
4. The JPT should engage a CRIRSCO[119] compliant company to develop an accredited Resource Prospectus from all the existing data on the deposit.

[119]CRIRSCO: Committee for Mineral Reserves International Reporting Standards (e.g. SAMREC, JORC). www.crirsco.com

5. The JPT should publish a call for Expressions of Interest (EOI) in appropriate international media/websites to get the maximum possible coverage of potential investment partners. The EOI should include the bidder's financial and technical capability (including similar project experience) to carry out the project.

6. A shortlist of 10-20 of the top EIO companies/consortia should be made, based on their capability to execute the project and other criteria desired by government.

7. The JPT should engage world-class transaction advisors using resources from existing facilities/resources (ALSF,[120] ISLP,[121] UNDP, etc.) and/or resourced by a project partner Development Finance Institution (e.g. AfDB, KfW, IDC, DBSA, etc.) in partnership with a local investment bank, selected by ZMDC.

8. The short-listed companies should then be invited to pick up the Request for Proposals for a small fee ($20k-$40k) which will contain the "Bid Pack" including the critical bid scoring matrix, outlining the nation's aspirations to optimise all of the project's potential economic linkages. The potential bidders should be given at least 90 days to develop and submit their bids and tender matrix elements (see Table 32).

Table 32: An indicative Mwanesi Bid Matrix could comprise:

Tax Rate (RTT)*	Bid up from, say, 50%	40%
Downstream	% extra VA (iron/steel) above base product (ore, conc) exports	20%
Upstream	% local content (VA) purchases @ 5y, 10y, 15y = Σ%VA	20%
HRD & R&D	$/an local spend- Bid up from $X/an	10%
Extra infrastructure	% extra capacity times the base capex for power, transport, water, etc. = Σextra$ (above obligatory excess capacity)	10%
Total		100%

9. The sealed bids should be opened and scored at a public event and the top two preferred bidders should be announced immediately.

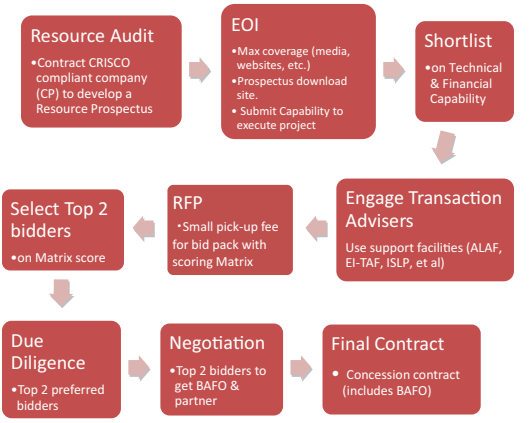
10. A thorough due diligence should be carried out on the top two preferred bidders and if one fails, it should be replaced by the third-placed bidder.

11. Negotiations to arrive at a Best and Final Offer and finalise the concession contract elements should be carried out simultaneously with both bidders (in separate rooms) to flush out the best possible contract for the peoples of Zimbabwe and Mozambique.

12. The final concession contract for ~30 years should be drawn up and concluded between Zimbabwe, Mozambique and the concessionaire, with clear investment and output milestones, which if not met, could trigger a concession suspension.

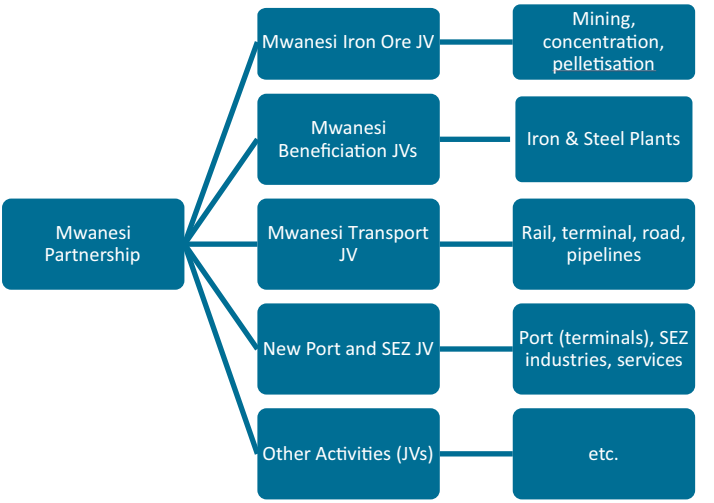
13. Execution of the concession contract.

Figure 55: Mwanesi- Possible Tender Process



[120] ALSF: African Legal Support Facility (AfDB)
[121] ISLP: International Senior Lawyers Project

Figure 56: Mwanesi SDI: Possible Project Structure



3.10.2.7 CONCLUSIONS ON MWANESI

The Mwanesi Range iron ore resources could underpin a putative Mwanesi SDI that could be configured to be by far the largest investment and development project in the history of both Zimbabwe and Mozambique, and dramatically lower national logistics costs. This could facilitate economic activity in diverse industries across the economy and position Zimbabwe's manufacturing sector to compete in global markets.

4. CONCLUSIONS & RECOMMENDATIONS

The purpose of this study has been to review the state of the mining sector activities in Zimbabwe and to provide a comprehensive analysis of key policy issues for transforming the industry into an engine for economic growth and transformational development for the benefit of the people of Zimbabwe.

Zimbabwe has a diverse and well-developed minerals sector which is rapidly recovering and plays an crucial role in its economy as a source of fiscal revenues, as an employer, a foreign exchange earner, as the provider of raw materials to the manufacturing, metallurgical sectors and agricultural sectors and as a market for supplier industries. The mining sector used to be supported by an exceptional physical and financial infrastructure which is in dire need of rehabilitation and expansion. In addition, there used to be a well-established manufacturing sector which was able to provide a substantial proportion of mining inputs, which needs to be reactivated.

By far the major two problems facing the mining industry have been insufficient and erratic power supply as well as the lack of mineral policy certainty (combined with sudden impositions of new royalties, fees and opaque indigenisation targets). The adoption of the multiple currency system; economic reforms that resulted in macroeconomic stability and strong international prices have however underpinned a remarkable recovery of the sector since 2009.

The next pressing problem is the acute national shortage of capital and high interest rates. This particularly affects the smaller mines (mainly gold) that lack the ability to raise capital abroad. A prerequisite for building liquidity in the economy is the resolution of the national debt burden. The debt stock amounted to US$8bn in nominal terms in 2011 and most of it was in arrears and continued to accumulate interest adding to the debt burden. In 2010 Government of Zimbabwe adopted the Zimbabwe Accelerated Arrears Clearance, debt and Development Strategy (ZAADDS). The strategy focuses on leveraging Zimbabwe's natural resources in pursuit of debt relief and development and negotiating for arrears clearance, new financing and comprehensive debt relief among other initiatives. The Government also upgraded debt management through setting up the Zimbabwe Aid and Debt Management Office (ZADMO) in 2010. These initiatives are laudable in that they sent positive signals within Zimbabwe and the International community on the seriousness of the Government of Zimbabwe to tackle the menacing debt problem and its intention to manage future debt sustainably.

Furthermore the Reserve Bank should be recapitalised, in part possibly through the proposed RRT 30% advance, which would allow it to play its role of "lender of last resort" to the commercial banking sector and to consequently bring down interest rates through the repo rate. A capitalised RBZ will facilitate the development of the financial sector and thus easy the liquidity challenges that are stifling new capital injections into the productive sectors including the mining sector.

The increases in energy costs, caused by ZESA's requirements to rehabilitate and expand the current generation and transmission capacity, as well as supply shortages, are constraining the sector. This should be urgently resolved through temporarily allowing major foreign exchange earning mines to import electricity until ZESA's rehabilitation/expansion projects give it the capacity to supply locally, as well as licensing IPPs (e.g RioZim's Sengwa thermal power project). In addition to the expansion and new build projects currently under consideration, the viability of Zesa partnerig with coal miners in Tete Province in Mozambique on their planned low-cost thermal power projects, should be investigated.

As a land-locked country Zimbabwe has logistic problems in getting its mineral products to the nearest ports. These problems have been compounded by the virtual collapse the NRZ and the limited capacities of the Mozambican ports of Maputo and Beira (two-thirds of Zimbabwe's exports before the independence of Mozambique), forcing exports to leave via more distant South African ports, at higher cost. As with ZESA, the NRZ's major constraints are capital and skilled personnel (managerial and professional), compounded by the exodus during the economic crisis period 2000-2008.

Due to the massive exit of skilled personnel, their replacement is now cited by most medium to large mining companies as their most serious problem after power shortages. There was a steady flow of experienced staff out of the country after independence (mainly settlers) which became a stampede during the melt-down (mainly Zimbabweans), though there have been some signs of skills returning.

Over the last thirty years the mines have moved away from migrant labour and currently have a permanent workforce, but this has not led to a significantly greater degree of mechanisation, due to capital constraints.

Only a small fraction of the total value of mineral production is consumed by local industries. By far the majority is exported to be transformed into finished products elsewhere, some of which will ultimately be re-imported by Zimbabwe. Primary commodities, mineral and agricultural, typically constitute about 90% of total exports. There are several projects for the further transformation of minerals in the country that have been under consideration for some time such as the manufacture of stainless steel from local chromium, nickel and steel; the refining of PGMs, the manufacture of refractory bricks; the spinning of asbestos fibre, and a coal-based chemical industry.

But, as long as downstream transformation is only for import substitution for the local market, the primary commodities sector (mining and agriculture) will continue to be the foreign exchange generator for the rest of the economy and the manufacturing sector will continue as a net foreign exchange consumer. Strategies for integrated economic development therefore need to increase exports of manufactures, decrease dependence on primary commodity exports

and decrease dependence on imported capital goods by developing a local capital goods manufacturing capability. Given the limited possibilities of Zimbabwe penetrating the world market for manufactures, regional economic integration (or "collective self-reliance") is the only viable method of breaking away from the present vertical integration with developed world and, increasingly, Asia.

A regional strategy is not only necessary in terms of an increased market for manufactures, but also in terms of utilising the larger resource base (human and material) for the development of primary industries, particularly capital goods. The SADC region produces, or has resources of, virtually all the raw materials essential for integrated industrialisation. Regional cooperation in metals refining has already taken place in the case of copper-nickel matte from Botswana and, previously, copper concentrates from Mozambique were refined in Zimbabwe, but there is a large potential for similar schemes in the region.

But by far the most important regional cooperation by Zimbabwe with another SADC state was the securing of the rail and road corridors through Mozambique to the ports of Beira and Maputo. This cooperation could be massively expanded through the putative Mwanesi SDI. An essential prerequisite for the maintenance of mineral production is the provision of an operational and cost-effective transport system for exports.

Beyond these general considerations, the analysis in this report has produced specific recommendations for strengthening mining sector policies, institutions and procedures, covering minerals governance and measures to optimise five types of linkage effects: fiscal linkages, backward (upstream) linkages, forward (downstream) linkages, knowledge linkages and spatial linkages.

4.1 MINERALS GOVERNANCE

The current "free-mining" (FIFA) colonial mineral regime is inappropriate for using mineral assets to underpin wider development and industrialisation and consequently consideration should be given to the following proposals on the administration of national mineral assets:

1. Streamline (simplify) the Mines and Minerals Act (MMA) to cater for exploration licenses and ASM (Artisanal and Small-scale Mining) prospecting licences, ASM leases, and Mining Leases on a use-it-lose-it principle. Shift the detailed procedures and modalities to attendant MMA Regulations;
2. Amend the MMA to cater for a hybrid of FIFA (claims) and a public tender system (for "unknown" and "known" mineral resource terrains, respectively) and to cover backward and forward linkages milestones (e.g. % value added at 5, 10, 15, 20 years) and a corporate minimum for spending on knowledge formation (human resource development [HRD] and R&D) of at least 5% of payroll;
3. Build a mineral deposit public tender (auction) capacity in the Ministry of Mines and Mining Development (MM&MD) and the Zimbabwe Mining Development Corporation (ZMDC);
4. Urgently locate funds to establish a functional national mineral cadastre (MCIMS);
5. Rebuild the ASM support "golden triangle": finance, marketing and technical support;
6. Establish an ASM Venture Capital Fund with the Chamber of Mines of Zimbabwe (COMZ), donors, et al.
7. Reconfigure the Zimbabwe Geological Survey (ZGS) as a state agency with the ability to re-attract requisite professionals;
8. Resource ZGS to recommence systematic geo-mapping and to categorise the country into known, unknown and partly known mineral resource zones;
9. Capacitate ZMDC and ZGS to develop mineral targets for public tender;
10. Urgently resolve the national power crisis through fast-tracking the current rehabilitation and expansion projects as well as through imports. Power from Mozambique needs to be assessed, both from Cabora Bassa (and, in future, the Mpande Nkuwa hydro-electric power station) as well as from the planned thermal plants based on waste coal from the Tete coalfields (Vale and Rio Tinto).

4.2 FISCAL LINKAGES

The current mineral fiscal regime neither effectively captures resource rents nor optimises the developmental impact of mineral extraction. Consideration should be given to the following proposals to maximise the capture of resource rents without sterilising resources and whilst still remaining attractive for FDI:

4.2.1 FISCAL REVENUE INSTRUMENTS

1. Corporate Income Tax (CIT): Currently at 25% except for Special Mining Licenses (SMLs) at 15%. Standardise at 25% (national rate) for all mining;
2. Royalties: Currently 1% - 15% (by mineral). Lower royalties to 1-2% for all minerals. Royalties sterilise resources and encourage high-grading (sub-optimal extraction);
3. Resource Rents Tax (RRT): Currently 0% except for an APT on SMLs at 42.5%. Increase to 50% above a return on investment (ROI) of the treasury long-bond rate plus 7%; until a market for long-bonds is established, the threshold ROI can be set at 20%;
4. RRT advance payment: Currently 0%. Consider a 30% RRT advance (against the mining workplan) at e.g. Moody's AAA Corporate Bond Index rate (MOODCAAA) plus about 3%;

4.2.2 ECONOMIC STRATEGY FISCAL INSTRUMENTS

1. Impose a Mineral Export Tax of 1-5% on all unprocessed mineral exports where the next value addition step has been independently shown to be economically viable (e.g., real IRR >10%);
2. Establish a ring-fenced Fiscal Stabilisation Fund using 30% of the proceeds of the RRT (locked offshore fund);
3. Establish a ring-fenced Minerals Development Fund using remainder of the proceeds of the RRT, ex the RRT advance;
4. Make local expenditure on HRD/R&D of ⩾5% of pay-roll a condition in all Mining Leases;
5. Reduce the Withholding Tax on expatriated dividends to 15%, but increase to 30% for investors domiciled in tax havens;
6. Abolish the practice of permitting the retention of mineral rights against the payment of Retention Fees (use-it-or-lose-it principle);
7. Impose a requirement for a 5-yearly "Forensic Tax Self-Audit" in all Mining Leases with revenue exceeding $200mn/an. The audit should be undertaken by a reputable audit company selected from a list of four supplied by ZIMRA and should be financed by mine, but report to ZIMRA;
8. Impose a Capital Gains Tax (CGT) of 50% on all Exploration License transfers (sale before mining commences) to discourage speculators; and
9. Clarify the Indigenisation Policy by making the targets 25% by year 10 and 51% by year 25 (i.e. any Mining Lease renewal (at 25 years) must be conditional on 51% beneficial ownership by indigenous Zimbabweans).

4.3 BACKWARD LINKAGES

Building the seminal minerals backward (upstream) linkages activities is crucial to using the national mineral resource endowment to underpin wider industrialisation. In this regard the following proposed interventions should be assessed:

1. Resolution of the power constraints through the rehab of existing capacity, the fast-tracking of expansion projects, new projects and imports;
2. Amend the MMA to include upstream value addition (backward linkages: local content[122]) as a clear objective of the Act and strengthen the Minister's power to include such conditions in the mining concession/lease. This could be done through the development of clear local content milestones (5, 10, 15 year targets) for all mining concession contracts (leases), starting with the current average for the type of mining (mineral), in order to maximise local value addition. The concession contract (lease) should make it clear that failure to achieve the asset owner's targets could result in a suspension of the contract and that after a reasonable rectification period, the asset will be re-concessioned (auctioned against developmental criteria). Once a new MMA is in place all current licenses should be revisited to include such local content milestones (and the new Act should cater for this);
3. Make local content commitments a bid variable with significant weighting for all new competitively tendered mineral concessions (auctions);
4. Consideration could be given to expanding the Indigenisation Law to cover purchases from indigenous suppliers[123], based on indigenous proportion of local value added in the goods or services supplied, rather than the total value of the goods or services, to facilitate backward linkages;

[122] Zimbabwean value added as a percentage of total purchases of goods and services.
[123] The South African BEE supplier experience could be useful in this regard.

5. Task the Ministries of Industry and Commerce, of Economic Planning and Investment Promotion, of Mines and Mining Development and of Science and Technology with developing and implementing comprehensive industrial sub-sectoral strategies to grow the mineral upstream sectors (capital goods, services, consumables) including the use of instruments such as import tariffs, investment incentives, innovation stimuli, market access, access to finance, competitive feedstocks, etc.

6. Task the ZMDC with developing appropriate local mining capital goods, with the private sector and technology institutions, to overcome the technological challenges of the minerals sector and to improve health and safety of workers.

7. Establish a Minerals Sector Knowledge Fund in partnership with the mining industry, through the obligatory spending floor of ⩾5% of payroll on local HRD and R&D, to rebuild the backward linkages skills and technology development capacity.

4.4 FORWARD (DOWNSTREAM) LINKAGES

Minerals and mineral products constitute critical feedstocks into a wide range of downstream sectors such as manufacturing, agriculture and infrastructure. In this regard the following proposals warrant further consideration:

1. Ensure competitive local prices (EPP: export parity pricing) of strategic mineral feedstocks into manufacturing, infrastructure, energy, agriculture;

2. Resolve the debilitating power constraint through investments into power generation and through imports, including the temporary permitting of direct imports by mineral beneficiators;

3. Harmonise mineral production and industrial strategies through strong coordination of Ministries of Mines and of Industry, of Agriculture, etc.

4. Introduce beneficiation milestones in mining leases at 5, 10, 15 and 20 years and make downstream value addition a bid variable for all new competitively tendered mineral concessions;

5. Impose a small export tariff (<5%) on select raw mineral exports to encourage beneficiation (where independently shown to be viable).

6. The viability of a refinery for Platinum Group Metals (PGMs) should be independently assessed and, if positive, an export tax on unrefined PGMs should be considered;

7. The viability of a stainless steel slab plant should be independently assessed and, if positive, an export tax on ferrochrome and nickel exports should be considered;

8. Establish new steel producers (Mwanesi?) to sell at EPP in the domestic market;

9. Investigate the viability of establishing a plant to produce petrochemicals (particularly polymers) and fertilisers from coal/gas resources;

10. Ban all scrap metal exports (reserve for domestic use);

11. Use "Producer Power" for PGMs: Amend the Gold Trade Act to also require PGM Authorised Dealers and engage the government of South Africa on the feasibility of collaborating on the marketing of PGMs and growing downstream industries ;

12. Enlarge the local market through equitable regional integration (SADC, SACU, CMA);

13. Support beneficiation technology and skills development (Knowledge Fund).

4.5 KNOWLEDGE LINKAGES

Establishing the minerals knowledge linkages (skills and technology development) is critical to developing the back/forward linkages. In this regard the following proposals should be considered:

1. Undertake a survey to identify the critical minerals technical skills needs and develop of a national minerals (and linkage industries) HRD strategy;

2. Re-attract skills from the diaspora through interventions to locate skilled Zimbabweans, to assist in their relocation and on remuneration for critical scarce skills;

3. Introduce a minimum minerals knowledge spending target of 5% of payroll (amend MMA) to fund local skills formation and tech development for the minerals sector and back/forward linkage industries;

4. Convert tertiary state technical training costs to notional student loans to be worked off over 15 years by working in-country (coverts to real loan if graduate exits before 15 years);

5. Rebuild mineral technology development institutions (Institute for Mining Research, Government Metallurgical Laboratory, Bulawayo School of Mines)
6. Use of a portion of the proposed RRT to fund:
    a. The training and remuneration of Maths and Science teachers to upgrade school education.
    b. Free engineering and science tertiary education;
    c. Financial support to Engineering and Science Faculties, including post-grad programmes;
    d. Grants for Engineering and Technician learnerships.
7. Investigate the establishment of a dedicated Minerals Technology Fund (MTF) as a Public-Private Partnership (PPP) with the mining industry, pedagogical institutions and state enterprises (ZMDC) and institutions.

4.6 SPATIAL LINKAGES

Mineral endowments can have significant spatial linkages both through the development of local communities and the collateral use of mineral infrastructure (transport, power, water) by other sectors. In this regard the following interventions should be considered:

1. Stipulate third party access at non-discriminatory prices to all mineral infrastructure, as well as obligatory reasonable over-capacity, to cater for other users;
2. Make investment in excess infrastructure capacity a bidding criteria for all public tenders of mineral assets;
3. Permit coal/gas extraction companies to establish IPPs (independent Power Producers) to supply Zesa at reasonable (cost plus) tariffs;
4. Oblige all Mining Lease holders to establish Corporate Social Investment (CSI) programmes in the surrounding communities and to report on them annually;
5. Concession future mineral export rail corridors to the users for the minimum viable concession period, with third party access at non-discriminatory prices and minimum excess capacity for other users;
6. Establish a Mwanesi Spatial Development Initiative (SDI) based on the huge Mwanesi iron ore resource, through the public tender of the resource that selects the investment partner that maximises the spatial (infrastructure) impacts as well as the other linkages. This should be done together with the government Mozambique to give the Zimbabwean economy a low-cost logistics corridor to the coast and the global economy.
7. Investigate options for a second SDI based on a national coal export corridor.

4.7 FUTURE RESEARCH AGENDA

This report has highlighted numerous area/issues that require further investigation and assessment in order to provide policy makers with evidence-based analysis to guide policy reforms that will maximise the mining sector's contribution to the economy. These include:

4.7.1 ON MINERALS GOVERNANCE

Project 1: Legal and mineral economics research to simplify the mineral legislation (rework the MMA) to legislate for four basic mineral rights (licenses or leases): (1) An Exploration License (2) A Small-scale Prospecting Licences, (3) A Small-scale Mining Lease (ASM) and (4) A Mining Lease. This research should also propose amendments to the MMA to cater for a hybrid FIFA (claims) and public tender system over "known" and "unknown" mineral resource terrains, respectively and amendments to facilitate greater backward and forward linkages value addition and a minimum lease-holder spend on local knowledge formation;

Project 2: Research on best-practice in the public tender of state assets (PPPs) and the optimal location and configuration of such capacity within the state administration;

Project 3: Research into global best-practices in supporting responsible artisanal and small-scale mining (ASM) and proposals on how to rebuild and expand the previous ASM support "golden triangle" (finance, marketing and technical support);

Project 4: Financial Research on the optimum methods of resourcing and configuring an ASM venture capital fund (VCF), together with the COMZ, donors, et, al, with a special window for female ASM;

Project 5: Research on the reconfiguration of the Zimbabwe Geological Survey (ZGS) as a state agency with the ability to re-attract requisite professionals, and methods of resourcing and organising the ZGS to undertake systematic geo-

mapping, to categorise the country into known, unknown and partly known mineral resource zones and to develop mineral targets, arising out of the geo-mapping, for public tender;

Project 6: Research on the role of the state mining company (ZMDC) in facilitating both mining and mineral linkages, including proposals on its shareholder mandate and its reconfiguration to realise the mandate.

4.7.2 ON MINERAL FISCAL ISSUES

Project 7: Econometric research on the probable impacts of all the fiscal proposals contained in this report, particularly the forecast impact on fiscal revenues (for various price and production scenarios). This research should also cover proposals on the fine-tuning of the recommended instruments and the building of the requisite state capacity to effectively administer the new mineral fiscal regime.

Project 8: Research on global best-practice in establishing (configuring) and managing a Sovereign Wealth Fund, with dedicated windows for an Infrastructure Fund, Fiscal Stabilisation Fund and a Minerals Development Fund. It should include global experiences in successfully protecting the fund from being accessed for short-term contingencies.

4.7.3 ON BACKWARD LINKAGES

Project 9: Research on global experiences in developing the resources extraction and processing supplier clusters, including the best instruments for facilitating such development (both carrots and sticks) and an analysis of the minerals inputs supply-chains. The research should identify critical missing links in such chains and recommend strategies for their establishment;

4.7.4 ON FORWARD LINKAGES

Project 10: Techno-economics research on global best practice in facilitation minerals value addition, including an assessment the most efficient instruments, such as judicious export taxes. The research should also assess the viability of establishing the following beneficiation plants: a PGM refinery, a coal/gas based petrochemicals plant and export-based iron/steel and stainless steel plants;

Project 11: Research on producer bodies and their efficacy, including the possibility of creating a PGM marketing body together with South Africa to facilitate the location of downstream industries in the two states;

4.7.5 ON KNOWLEDGE LINKAGES

Project 12: Research into global best-practice in rapidly upgrading the national technical skills pipeline (engineers, scientists and technicians/artisans), including the optimal interventions to effect such an expansion of the national technical skills complement;

Project 13: Research onto the creation a robust Zimbabwean mining and mineral processing technology development capacity, including instruments and interventions to realise this;

4.7.6 ON SPATIAL LINKAGES

Project 14: An assessment of the viability of both an iron ore (Mwanesi) based SDI and a coal resource based SDI, to the Mozambican coast, including all the possible collateral impacts on other sectors.

Project 15: Assessment of options for the import of power from Mozambique, both hydro-electric power (from Cabora Bassa and, in future, Mpande Nkuwa) as well as from the planned thermal plants based on waste coal from the Tete coalfields (Vale and Rio Tinto), including the efficacy of ZESA partnering (JV) on the thermal plants (their waste coal supply costs are likely to be significantly lower than domestic plants resulting in lower electricity costs).

4.8 FINAL WORD

Finally, Zimbabwe's mineral endowment could not only underpin the rebuilding of the economy, but could also catalyse wider industrialisation, growth and development. However, this will not necessarily happen under the current "free-mining" mineral regime with limited mining lease conditions. The mineral regime needs to be substantially overhauled to facilitate the maximisation of the developmental impact of finite resources on this and future generations, through ensuring that all the attendant economic linkage opportunities are realised. In the short term the most important constraint facing the industry is the national power shortage which needs to be urgently resolved.

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APPENDIX 1: TASK TERMS OF REFERENCE

Background

"An in-depth review of the policy environment affecting Zimbabwe's mining sector will be an essential starting point in the understanding of this sector's contribution to the national economy. The review will provide useful insights into this key and fast growing sector of the economy. A few observations on the growth and development of the sector in the past decade suggest the importance of this issue:

From 2006 to 2011 the mining sector rose from 13.6% to 22% of GDP and this trend is expected to continue, given that with the exception of the services sector, the other real economy sectors are experiencing standstill or declining trends.

Zimbabwe's unique natural resource base could increasingly become a basis for realising resource linkages (backward & forward), taking into account Zimbabwe's diverse mineral resources including Platinum Group Metals[124] (PGMs), gold, diamonds, iron ore, copper, nickel, chromium, etc...

In the second half of the 2000 decade, the mining sector faced reduced output as a result of power outages, huge flight and shortages of skills and foreign currency.

The liberalization measures introduced in 2009 have restored sufficient confidence in the mining sector to allow several previously closed mines to reopen and resume operations, particularly in gold mining. There is continuing controversy, however, about the policy regime for attracting investment into the mining sector while also maximizing the economic benefits for the people of Zimbabwe."[125]

Duties and Tasks

"In order to lay the basis for improved formulation and implementation of policies to develop the mining sector, the proposed research will focus on the following tasks:

Prepare a comparative review of mining sector policies, focusing on the current policy environment affecting the sector, comparing and contrasting the situation in Zimbabwe with the legal and institutional frameworks and policies in other mineral-rich countries in the region, such as Botswana, Namibia, South Africa, Mozambique and Zambia.

Using available production and trade statistics, information on industry linkages, and value chain analyses of major Zimbabwean exports (including PGM metals, iron ore, nickel, chromium, gold and diamonds), review the state of mining activities in Zimbabwe to date and provide policy recommendations or recommendations for further research on issues such as:

- Changes needed to best capture resource rents for the benefit of the people of Zimbabwe;
- Trade-offs on various methods of handling taxation of mineral resources, possibly including resource rent tax (RRT) on some mineral concessions;
- The most efficient ways to handle problems associated with the Dutch disease phenomenon, which is a function of net foreign exchange inflows, by channelling of excess net inflows into long-term physical and human infrastructure or a sovereign wealth fund (on the Norwegian model, as in Ghana or East Timor);
- Options for competitive concessioning of Zimbabwe's mineral resource endowments to maximise price discovery;
- Policies to strengthen employment and linkage effects, domestic value added, and poverty reduction effects from the development of the mining sector;
- Review the economics of mining sector activities that are increasingly subject to the Indigenization and Economic Empowerment regulations, to highlight likely unintended consequences and possible alternative paths to achieve empowerment objectives;
- Review of the role of key Stakeholders, such as the Chamber of Mines, the Institute of Mining Research at the University of Zimbabwe, and make recommendations on the roles of these support institutions;.
- Suggest an agenda for future research to provide policy makers with evidence-based analysis to guide policy reforms that will maximize the mining sector's contribution to the economy;
- Build into the policy analysis and the proposed research agenda implications for gender mainstreaming and poverty reduction via development of the mining sector; and
- Mentor ZEPARU staff on research methods, in the course of conducting the study."[126]

[124] The group consists of Platinum, Palladium, Rhodium, Ruthenium, Osmium and Iridium.
[125] Project SOW (Nathan & Associates)
[126] SOW, op cit

Box 5: Project Deliverables

A full, polished, professional quality draft of an evidence-based policy research report, comprising the following elements:

- An institutional review of the Zimbabwe mining sector policy environment;
- A comparative analysis of neighbouring country mining policies;
- Recommendations for policy reform to maximize the contribution of the mining sector to economic development and poverty reduction in Zimbabwe;
- A road map on future research on the contribution of the mining sector in the Zimbabwean economy;
- A plan for short policy briefs on Zimbabwe's mining sector, taking into account (among other things) gender and poverty reduction dimensions;
- A final report, revised in light of comments on the draft report received from ZEPARU, SERA, USAID and other stakeholders, subject to the condition that all such comments must be provided within two weeks following the submission of the full draft report; and
- A debriefing presentation to USAID, SERA , ZEPARU and other interested parties, if so requested by USAID and the SERA Chief of party.

APPENDIX 2: HISTORY OF MINING IN SOUTHERN AFRICA

Southern Africa is one of the only areas on earth that contains a complete history of mining, going back to pre Homo sapiens, and continuing with the first human workings through to the first underground mines, on to iron age mining and finally colonial commercial mining.

It contains evidence of some of the very earliest use of minerals in the form of stone tools by pre-humans, Homo habilis, at for example Sterkfontein and Kromdraai (1.7 - 2 million years BP). These are arguably represent the earliest recorded "quarrying" by hominids.

The first use of minerals by Homo Sapiens is probably the recent discovery at Pinnacle Point (Mossel Bay) of the heat treatment of rock (silcrete) to harden it for the making of microlith (flake) tools (80 -150 000 years BP) constituting the first human heat treatment.

An engraved plaque of ochre (hematite) was found at Blombos Cave (near George in SA), dated at 75 000 years BP and is the first evidence of human art or possibly writing, though the meaning of the striations is unknown.

The first known underground mine is at Lion Cavern (Ngwenya) in Swaziland (20 000 - 43 000 years BP) where the ancestors of the San people mine iron oxides for ochre for rock painting. This deposit was later mined commercially by Anglo American in the 60s and 70s (Ngwenya Mine) and the iron ore was exported from Maputo on the Goba railway line. The early San ("Bushman") hunter-gatherers did not possess smelting technology but did exploit fine grained, glassy, rocks such as obsidian and chalcedony for the manufacture of stone implements and weapons. Various iron oxide ochres were also used for painting. It was not until the arrival of the Bantu-speaking iron age cultures that the mining and smelting of iron began. Ancient smelting sites, usually identified by slag heaps and tuyer shards, are to be found right across Zimbabwe, the earliest of which has been dated as the 2nd Century.

By the 11th Century these people had developed more elaborate forms of social organisation that also included a substantial mining and smelting industry based on other metals such as gold, copper and tin. In 922 an Arab traveller, al-Mas'udi of Baghdad, visited Sofala, on the Mozambican coast, and reported a large trade in gold and ivory coming from a kingdom in the interior (Zimbabwe) at that time already. From the 11th Century onwards, gold from Zimbabwe was carried by Arab and Swahili traders from the southern African coast to the Arab world and on to the Indian and Asian markets.

The construction of the spectacular stone buildings of Great Zimbabwe, at the time the largest city in sub-Saharan Africa, which took place from the 13th to the 15th Centuries, could well have been related to the dramatic increase in wealth from the thriving gold mining industry at this time. It has been estimated that there exist about 4000 ancient gold workings and about 500 ancient copper workings in Zimbabwe, Mozambique and Botswana, mainly in Zimbabwe on the Achaean schistbelts, principally dating from this period.

Under a Rozvi chief called Mutota, the Munhumutapa (meaning "pillager") Empire was built in the first half of the 15th Century and it split into two at the end of the 15th Century: the Munhumutapa in the north and the Changamire in the south. Both of these groupings controlled numerous shallow gold mines principally in the schistbelts (goldbelts) which occur right across the country.

The rise of mercantile capitalism in Europe brought the Portuguese in the 16th Century, in search of gold, copper and slaves, who sought to replace the lucrative Arab-African trade that had been in existence since before the 10th Century. The Munhumutapa allowed their penetration in the north, but the Changamire refused them entry to the southern region.

In 1573 the Munhumutapa granted the Portuguese mining rights, for gold and other minerals, in northern Zimbabwe and Mozambique. In the late 1620's the Portuguese launched two military campaigns against the Munhumutapa state and installed a puppet Munhumutapa. At the end of the 17th Century the Changamires managed to throw the Portuguese and their puppet Munhumutapa off the Plateau and install a northern vassal kingdom. The Changamires dominated the gold mining industry and gold trade, via the Sabi/Save valley to the coast, until they were routed by the Nguni (Ndebele) invasion under Mzilikazi in the 1840's, fleeing the Boer expansion into the Transvaal.

The 19th Century European explorers such as David Livingstone and Karl Mauch encountered wide evidence of the earlier thriving gold mining industry. In the 1880's the Cape diamond and gold mining magnate, Cecil John Rhodes, sent representatives to the Ndebele capital, Bulawayo, to obtain mineral concessions. In 1889 Rhodes floated the BSAC and obtained a Royal Charter to install an administration over the Zambezi territories. This was done to contain the Boers south of the Limpopo and because the reputation of the Munhumutapa gold fields had led Rhodes to believe that present day Zimbabwe contained gold deposits to rival the Witwatersrand.

Iron and copper mining and smelting appears from c. 200 AD and there are thousands of iron smelting sites across southern Africa!

The photo depicts a Venda-type iron smelting furnace in1888. The manufacture of traditional iron products (axe heads, hoes, arrow heads, assegais, etc) continued up till the 1950's. The numerous Hwedza hill iron furnaces in Zimbabwe were described by early colonists as the “Sheffield of Africa”.

Some Ancient Base Metal Mining Sites in Zimbabwe and SA

Source: Hammel, White, Pfeiffer & Miller 2000, "Pre-colonial mining in southern Africa", SAIMMJ, Jan/Feb 2000, 49.

Gold trade via the eastern seaboard to the Middle East and Asia well- established by c. 900 AD and gold was an important commodity in the Mapungubwe (c. 1220 -1270) and Zimbabwe/Munhumutapa states where numerous gold artefacts have been found in numerous sites.

Many of these sites also contain Asian trade goods and gold and ivory where traded with the east via the Dhow trade up the east coast of southern Africa to the Middle East and beyond. Items of Ming Dynasty ceramics have been found at Mapungubwe. The Mapungubwe state was probably a precursor of the ancient Zimbabwe (Munhumutapa) state with extensive gold mining. There are over 4000 ancient gold mines and workings in southern Africa[1], predominantly in Zimbabwe and northern SA (Limpopo Province). Although Great Zimbabwe is not close to the local gold seam, its power derived from controlling the trade in gold. During this period mine shafts were sunk to a depth of 100 feet and complex mining methods were used including ventilation shafts an fracturing the rock face with fires.

Copper was mined at Phalaborwa and Mussina (on Zimbabwe-SA border) and "the earliest South African example of a shaft, gallery, or adit was found at Lolwe Hill, Phalaborwa, where ancient miners sought malachite and azurite (the site is now the location of a large open pit mine). A shaft 6 metres in depth with a 10 metres horizontal gallery was dated at AD 770"[2]. It is possible that these technologies were later applied in Zimbabwe, where similar mining methods were used at a later date.

The Rooiberg tin mines (SA, Limpopo Province) operated from the 15th to the 17th Century and the Mussina copper deposits were probably mined from the 10th Century, but unfortunately the early workings were destroyed by the European miners at the start of the 20th Century.[3]

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[1]Summers, R, "Ancient Mining in Rhodesia and Adjacent Areas", National Museums of Rhodesia Memoir No 3. Salisbury, The Trustees of the National Museums of Rhodesia, 1969.
[2]Hammel, A. et al "Pre-colonial mining in southern Africa", Journal of the SAIMM, Jan/Feb 2000, p52
[3]Herbert , E.W., "Red gold of Africa: copper in precolonial history and culture". Univ of Wisconsin Press, 2003, p27

With the rounding of the Cape by Barlowmeu Dias in 1488 and the subsequent sacking of the east coast island city-states (Kilwa, Mocambique, Zanzibar, etc.) by the Portuguese "conquistadores", their attention turned to the main source of the gold- The Munhumutapa (Zimbabwe) state. After two unsuccessful campaigns the Portuguese finally managed to subjugate it and install a puppet Munhumutapa, but the fabled gold was is illusive, as it was spread over thousands of ancient workings in the Goldbelts (Greenstone Belts) and there is no record of substantial plunder accruing to the invaders.[4] By the 18th Century the Portuguese had lost their grip on the ancient Zimbabwe state and the remnants survived as numerous chieftaincies and polities, with minor gold mining activities.

The invasion of the Cape by the Dutch East India Company (VOC) in 1652 heralded the start of the systematic dispossession of indigenous southern Africans of their land, minerals and liberty. However, in the hinterland, "...by the time the European settler community arrived in the region almost every gold-bearing quartz outcrop had already been worked, nearly every viable outcrop of copper-bearing rock had been exploited, and hardly a tin lode of any importance was left untouched" by the indigenous miners.[5]

"European colonization was the ultimate constraint on these indigenous operations as imported goods rapidly undermined the value of traditionally produced goods and local mining declined dramatically. Although much of the evidence of pre-colonial mining has since been destroyed by modern mining operations, recent research has started to balance the colonial-oriented version of history with information regarding the achievements of indigenous miners and smelters—from whom, it seems, there is a lot to learn"[6]

The European "discovery" of diamonds in Griqualand in the 1860s led to the first southern African diamond "rush" by European opportunists from all over the globe, but the local inhabitants were denied diamond claims and relegated to the role of labourers for the invaders. This was repeated for gold in the Barberton Mountain Lands and Sabie (Pilgrims Rest) in the 1870s and later, when the world's largest gold formation, the reefs of Witwatersrand System, was exploited by the European plunderers.

Unlike Sabie and Barberton, the European "discovery" of the Wits main reef gold conglomerate on Langlaagte Farm (near Johannesburg) in 1886 did not precipitate the usual "gold rush" of European fortune seekers, due to the massive capital requirement to develop deep underground gold mines.

The discovery of diamonds at Kimberley in 1871 had already generated substantial capital from British and European banks to finance the new diamond mining houses started by colonists Cecil Rhodes, Alfred Beit and Barney Barnato and others, who eventually came together to form De Beers. Diamond capital was consequently available to mine the Wits gold. However, Rhodes "...wants this wealth for a very specific purpose. It is needed to fulfil his dream of establishing British colonies north of the Transvaal, as the first step towards his ultimate grand vision - a continuous strip of British Empire from the Cape to the mouth of the Nile."[7]

Cecil Rhodes, was an unscrupulous British imperialist and founded Gold Fields of South Africa (GFSA) in 1887 and the BSAC in 1889, through the merging of the Central Search Association and the Exploring Company Ltd., which received a royal charter from the British imperial government in 1889. "Modelling the BSAC on the British East India Company, Rhodes hoped it would enable colonisation and economic exploitation across much of south-central Africa, as part of the Scramble for Africa". He "...bought the Rudd Concession from King Lobengula ostensibly for mining purposes, but he brought an army and settled at present day Harare in 1890. Thereafter, Rhodes declared war on Lobengula and overthrew him and named the country Rhodesia. As a British colony, Rhodesia was characterized by:

1) A massive land grab exercise, which drove thousands of Africans, often at gunpoint, from 50% of the country into reservations, now called communal lands. Land was taken without compensation to the owner and given to Rhodesia's soldiers, or later to veterans of the two world wars of the 20th century, or to any white settler, but not to black persons. This racial land division was consolidated by the Land Apportionment Act of 1930 and the Land Tenure Act of 1969, which prohibited blacks to own land in white areas.

2) The exclusion of Africans from the political process. Africans were denied the right to vote or stand for parliament, or to hold high office in the army, police or public service.

3) Africans were excluded from the best schools, residential areas, and other amenities, which were reserved for whites only. Rhodesia was a mirror image of the apartheid policy, which then prevailed in South Africa".[8]

The European settlers took control of Rhodesia in 1923 when it became a settler self-governing British imperial crown colony. Subsequently European opportunists and adventurers poured in to exploit the country's rich natural resources and cheap subjugated local labour and the mining sector boomed with the opening of numerous mines, mainly based on ancient workings. The non-African alien population rose rapidly from 32,000 in 1923 to 220,000 by 1953 when the settlers extended their resource base through the formation of the Federation of Southern Rhodesia, Northern Rhodesia (Zambia) and Nyasaland (Malawi).

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[4]Summers, 1969, op cit
[5]Hammel, et al "Pre-colonial mining in southern Africa", Journal of the SAIMM, Jan/Feb 2000, p54
[6]Hammel, et al "Pre-colonial mining in southern Africa", Journal of the SAIMM, Jan/Feb 2000, p54
[7]History World 2012, "History of Zimbabwe", http://www.historyworld.net
[8]Ministry of Foreign Affairs 2012 "History of Zimbabwe", http://www.zimembassy.se/history.html

"The intended economic benefits materialized during the early years of the federation, helped by a world rise in copper prices, but this [was] not enough to stifle increasing political unrest - particularly as British colonies elsewhere in Africa win independence (beginning with Ghana in 1957).

In the early 1960s African politicians in Northern Rhodesia and Nyasaland win increasing power in their legislative councils. The pressure grows to break up the federation. In March 1963, by which time all three colonies are demanding independence, the British government finally concedes. The Federation is formally dissolved on 31 December 1963."[9]

Immediately after the dissolution of the Federation a white supremacist party (Rhodesian Front) took control of the Rhodesian settler government and threw the nationalist leaders into detention. In 1965 it declared UDI (Unilateral Declaration of Independence) from the British Empire. Limited sanctions were applied but were generally ineffective due to support to the settler government by the apartheid regime in South Africa.

The nationalist guerrilla war of liberation started in earnest in the early 70s, but did not have an appreciable impact on mineral output. By 1980 the white supremacist government capitulated and the country finally became an independent democracy.

Box 6: Geology & History

"The Zimbabwe Geological Survey (1990) identifies more than 500 individual deposits of base metal and industrial minerals in Zimbabwe. It describes Zimbabwe as 'an important producer' of gold, chrome, lithium asbestos and caesium, as well as high-quality emeralds. Modern mining began in 1892 and by 1990 over 40 minerals were being exploited. Over the first 100 years of modern mining activity, the two most valuable products by far were gold and asbestos but this has changed with the emergence of nickel and ferrochrome as major exports and, very recently, the exploitation of platinum group metals – platinum, palladium and rhodium.

Most mineral production is from the ancient Archaean core of the country where most deposits are concentrated in the greenstone belts that contain gold, copper, tungsten, antimony and arsenic. Nickel with its by-products of copper and cobalt is also mined in the greenstone belts, while asbestos deposits are found in the serpentized ultramaric intrusions. There are known huge resources of chromite and platinum along the Great Dyke that runs through the centre of the country from northeast to south-west.

Initially mining in Zimbabwe centred on the exploration and exploitation of gold deposits almost all of which were known from ancient workings. Subsequently, world class deposits of chromite and chrysotile asbestos were developed, along with Hwange coal. The Zimbabwe Iron and Steel Co (ZISCO) (as it is now known) was built to produce iron, steel and coke, while two major ferrochrome projects were developed, Zimbabwe Alloys, producing low carbon ferrochrome and Zimasco, which manufactures high carbon ferrochrome. Subsequently, an ammonium nitrate plant was opened at Zisco to produce oxygen-refined steel, while a large open-cast coal mine was developed at Hwange for coking coal and for steam coal to fire the Hwange Thermal Power Station.

Copper deposits were exploited by MTD Mangula and the Empress nickel deposit, discovered in 1956, was brought into production along with other nickel properties (Trojan, Shangani, Epoch and Madziwa in the 1960s and early 1970s). Two nickel deposits at Hunters Road and Damba-Silwane remain dormant. The Empress Nickel mine has closed but the refinery still operates for toll treatment of matte from the BCL mine in Botswana. Small open-cast mines were opened at Buchwa and Ripple Creek for iron ore, and at Dorowa for phosphate, along with a number of open-cast gold mines using extraction by heap-leaching.

Since 2000 however, a number of mines have closed, including the copper producers at Mangula, Alaska and Sanyati and the Epoch and Madziwa nickel mines. The Railway Block high-grade chromite mine has closed as well as the Dalny-Venice-What Cheer group of gold producers and the smaller Gaika, Motapa and Royal Family gold mines.
The original BHP Platinum mine at Selous, which opened in the late 1990s, was closed when the Australian mining company disinvested. The plant was subsequently restructured for the open-cast mining at Ngezi, while most recently diamond pipes at Murowa (the Rio Tinto group) and River Ranch have been mined on a small scale along with alluvial diamonds at Marange.
All existing mines operate under constraints – most notably the exchange rate, which has decimated gold production, and shortages of power, skills, ore and low sulphur coal required by the ferrochrome sector. Major expansion potential exists in the platinum industry with new underground mines at Unki (Anglo American), Ngesi (Impala Platinum) and Mimosa.
The Zimbabwe Geological Survey (1990) lists no fewer than 66 base and industrial mineral deposits found in Zimbabwe but in recent years production has become increasingly concentrated to the point where in 2006 seven products accounted for 98 percent of total value. In part, this growing concentration reflects price movements – the boom in gold and platinum prices – along with a shift in the composition of output towards higher value and value-added minerals, such as PGMs and ferrochrome.

Geological assessments suggest that underinvestment in exploration and production, and not mineral potential, have been the main factors limiting mining development in Zimbabwe. This is not a new phenomenon and pre-dates the onset of the political and economic crisis at the end of the 1990s. As long ago as 1992, the World Bank identified Zimbabwe, along with the DRC and Namibia, as 'Category A' countries requiring the highest level of exploration investment amongst African states of US$100 million over a five-year period ($20 million annually). In all three countries mining exploration had been constrained by political and economic uncertainty with mining houses reluctant to invest in a country with a track record of policy unpredictability, especially in terms of property rights and exchange-rate management."
Source: Hawkins T 2009, "The Mining Sector in Zimbabwe and its Potential Contribution to Recovery", UNDP, Comprehensive Economic Recovery in Zimbabwe, Working Paper #1.

[9]History World, op cit

APPENDIX 3: EXTRACT FROM STERP: MINING

(Short Term Emergency Recovery Programme (STERP) Getting Zimbabwe Moving Again, 2009, page 43)

Mining

136. The mining sector, a major earner of foreign currency, has been performing below its potential. Its recovery, taking account of the diverse mineral resource base, will be underpinned by various interventions over the coming year.

137. Raising the capacity in mineral production, continuous exploration as well as beneficiation and value addition of minerals will benefit from joint venture strategic partners who have the necessary technology and foreign currency back-up.

138. To ensure full exploitation of mineral resources, The Inclusive Government is reviewing the framework for mining rights, pricing of minerals and surrender requirements. The Mines and Minerals Act will also be amended to facilitate review of surface rentals, discourage hoarding and speculating in Exclusive Prospecting Orders.

139. There are structural deficiencies in respect of the register of all known minerals in Zimbabwe and their stock thereof. This is largely due to the absence of a clear exploration policy and the related issue of extraction. Quite clearly, there is a legislative deficiency in the above areas, a situation that has created rampant abuse of our scarce resources.

140. STERP will thus oversee the crafting of an Exploration, Registration and Extraction Mining Policy which will form the basis for a new comprehensive mining sector legislation. Under this overall Mining Policy, there will be separation of exploration from extraction policies and strategies.

141. Furthermore, The Inclusive Government will explore the establishment of an institution responsible for exploration issues including collecting and building a comprehensive database on quantity and quality of the country's mineral endowment.

Pricing of Minerals

142. A key component of STERP in reviving the mining sector will be to ensure that international commodity prices are levied and received by mining houses. In short, the pricing gap in respect of which domestic prices lagged behind international prices is a thing of the past.

143. Consistent with this policy, no more retention on commodity earnings will be made by any authority in Zimbabwe. However, as quid pro quo the Inclusive Government will review upwardly the taxation and royalty structures in line with international standards.

144. Equally, there will be greater demand made on mining houses on protecting of the environment. Furthermore, while the STERP will be allowing flexibility in marketing of minerals, The Inclusive Government is imposing social development obligations on mining houses.

Marketing of Minerals

145. To enhance value, the marketing of all minerals other than Gold will be done under the supervision of the Ministry of Mines and Mining Development together with the Minerals Marketing Corporation of Zimbabwe, a Board established through an Act of Parliament.

146. In the case of Gold, the same will remain a strategic reserve asset, whose licensing and marketing will be in terms of the Gold Trade Act. However international prices will still have to be paid to producers and no amount will be retained by the Reserve Bank of Zimbabwe.

147. Similarly, as in the case of other commodities, the Inclusive Government will review upwardly the taxation and royalty levels and structures.

148. Special attention will also be given to the small to medium gold producers. In this regard, a special facility will be created for the provision of short term finance and assistance.

149. To the extent that steel is not a mineral but an industrial product, STERP will take measures to ensure that its marketing thereof is done exclusively by the producer and not MMCZ.

150. In respect of outstanding amounts owed by the Reserve Bank of Zimbabwe to mining houses, these will be assessed and evaluated to establish authenticity and to ensure that repayments are done by the same within a reasonable time.

Amendment of the Mines & Minerals Act

151. To ensure full exploitation of minerals resources, The Inclusive Government will expedite the amendment to the Mines and Minerals Act, which is already before Parlaiment. The Act seeks to review the framework for mining rights, with a view of reviewing the mining title system, discourage hoarding of claims which are not being worked, and reforming the Mining Affairs Board.

Minerals Value Addition

152. The contribution of mining to the revival of the economy is limited by the low level of beneficiation and value addition to our mineral resources.

153. Initiatives to increase beneficiation and value addition for all major minerals including gold, platinum, nickel, copper, coal, coke, and other various non-ferrous ores and concentrate are being undertaken.

154. This will include penalties for the exportation of raw minerals where value addition options are readily available.

Precious Metals

155. Presently, virtually all diamonds, emeralds and semi-precious stones are exported in the raw form, whilst a small percentage of gold is manufactured into jewellery.

156. Concerted efforts will therefore be made to promote beneficiation and value addition programmes in the precious metals sector.

157. This process will take advantage of the existing local gold refinery and mature jewellery industry, which will make it immediately and commercially feasible to add value to our mineral resources.

158. Platinum producers will be urged to enter into local tolling arrangements for smelting, converting and base metal refining so that the country fully benefits from its natural resources.

Base Metals

159. Zimbabwe has the world's second largest chrome reserves. There is also great potential in expanding ferrochrome production in the country.

160. The Inclusive Government will therefore take advantage of the existing beneficiation facilities to refine all important base metals which include chrome, copper, nickel and iron ore.

161. The Lomagundi Copper Refinery will also be resuscitatated to ensure maximum beneficiation of locally produced copper which is currently being exported in concentrate form. The Refinery will further be utilised as a toll Refinery for copper concentrates from Zambia, the Democratic Republic of Congo, Namibia and South Africa.

162. Furthermore, the ban on the exportation of all forms of scrap metal which has encouraged local value addition of base metals will be maintained.

Industrial Minerals

163. Capacity to beneficiate industrial minerals currently remains low. This requires more effort to increase beneficiation capacity in the medium to long term.

164. In the interim, royalty payment levels on all industrial minerals currently being exported in raw form will be increased to encourage exporters to utilise suitable value addition technologies.

Energy Minerals

165. Coal presents the greatest potential for value addition in the energy sub-sector.

166. In this regard, coal mining companies will be instructed to export coke, instead of the traditional coking coal. Punitive measures in the form of increased taxation levels will be imposed for non compliance.

167. Through availing adequate resources for the use of acquired technologies, the country stands to benefit from increased revenues derived from the by-products of producing coke which include various solvents, tar, and with further processes, petrol and diesel.

168. The bulk of locally produced coal will be devoted to local thermal electricity power generation with the excess power being exported to the sub-region.

169. Furthermore, projects to exploit coal bed methane resources will be pursued.

Small Scale Mining Mechanisation

170. The Programme also provides for mechanisation support for small and medium scale miners with potential to generate substantial mineral exports.

171. The Scheme will be implemented in conjunction with the Mining Industry Loan Fund to assist miners with loans, access to machinery & equipment and technical services to boost production.

172. This therefore entails the recapitalisation of the existing Mining Industry Loan Fund.

173. In this regard, the Ministry of Mines and Mining Development is overseeing the finalisation of the necessary mechanisation strategies with the support of the mining industry.

APPENDIX 4: MINING & THE ECONOMY[10]

Zimbabwe's mining sector plays an important role in the socio-economic development of the country. The sector's contribution to the economy appears in several forms; inclusive of direct contribution to GDP, employment creation, foreign exchange generation, gross national investment, social infrastructure development and direct contribution to the government revenue. In addition, the sector has direct and indirect downstream (and upstream) multiplier effects to other economic activities. Facts on the ground reveal the mining sector currently constituting 13% of nominal GDP, 50% of the nation's total exports, 12% of fiscal revenue, 45,000 employment jobs, more than 50% of foreign direct investment, and corporate social investment in agriculture, health, education, housing, and infrastructure.

1. Distribution of the Mining Sector Revenue

Of the approximately USD2 billion revenue generated by the mining sector in 2011, 36% was consumed by purchase of materials, 15% by salaries and wages, 21% by other operating expenditures. The government and the mining companies benefited 17% and 11% respectively as shown in the pie chart below.

Distribution of the mining revenue

Source: Deloitte Tax Study 2012, RBZ, COMZ

The actual dollar distribution of the total mining sector revenue is shown in the abridged schedule below:

Distribution of Mining Revenue by Dollar Value in 2011($mn)

**Total revenue generated by the sector		2,000
Total cost of production for the sector		
Total wages paid by the sector	300	
Total supplies and consumables	720	
Other operating expenditures	420	
		(1,440)
		660
Total payments to the government		(340)
***Total profit for the sector shareholders**		220

***The figure excludes diamonds; *** The figure is a sum total of the profit and loss making companies (i.e. net of loss making mining companies).*

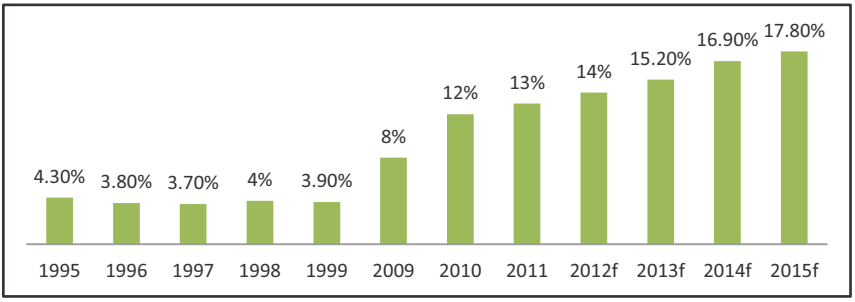
Source: Deloitte Tax Study 2012, RBZ, COMZ

[10]This Appendix was written by Isaac Kwesu

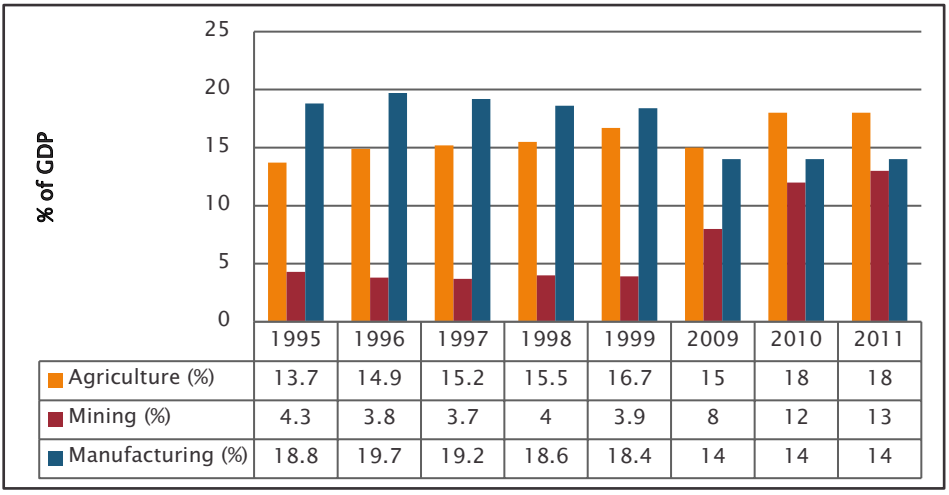
2. Contribution to GDP

From 1999 to 2008, mining sector contribution to total Gross Domestic Product (GDP) has been averaging about 4%. The contribution grew up phenomenally to average 11% between 2009 and 2011. In 2011 alone mining output is estimated to account 13% of gross domestic product (GDP) directly, although the indirect multiplier effects take the contribution to about 18.4% of GDP in total. The indirect multipliers include backward linkages (e.g. transport, supplies, professional services, etc.), forward linkages (e.g. electricity generation) and the induced effect via mining generated incomes.

Mining contribution to GDP (1995-2015)



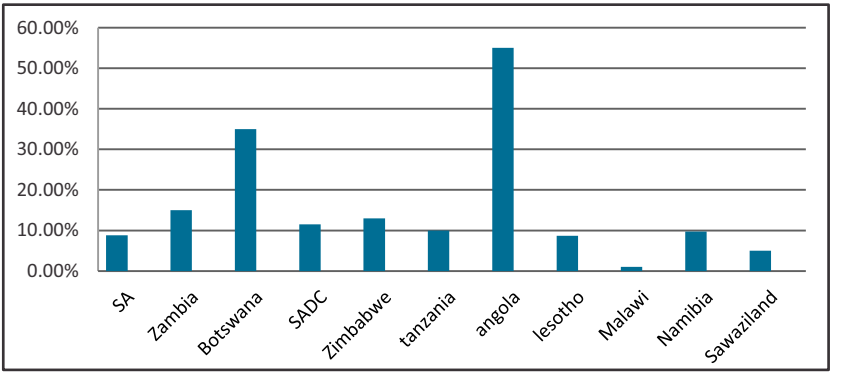
Contribution to GDP: sectoral comparison



	1995	1996	1997	1998	1999	2009	2010	2011
Agriculture (%)	13.7	14.9	15.2	15.5	16.7	15	18	18
Mining (%)	4.3	3.8	3.7	4	3.9	8	12	13
Manufacturing (%)	18.8	19.7	19.2	18.6	18.4	14	14	14

Source: MOF, ZIMSTAT

Regional comparisons: contribution of mining to GDP

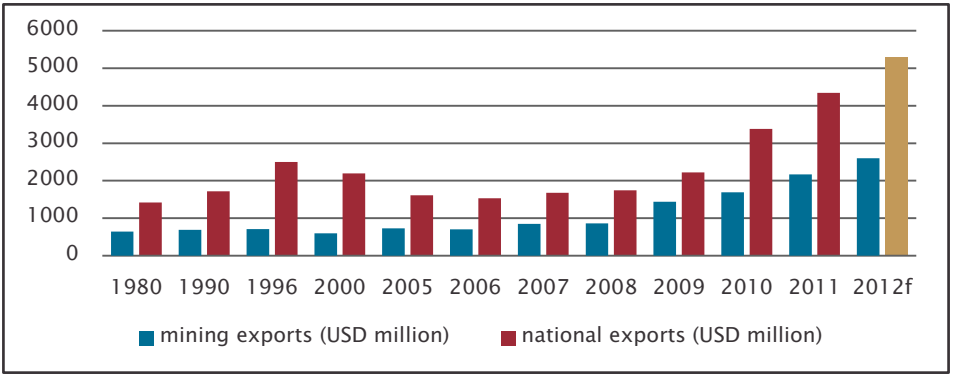


Source: Various Country Statistics

3. Contribution to Exports and Foreign Exchange

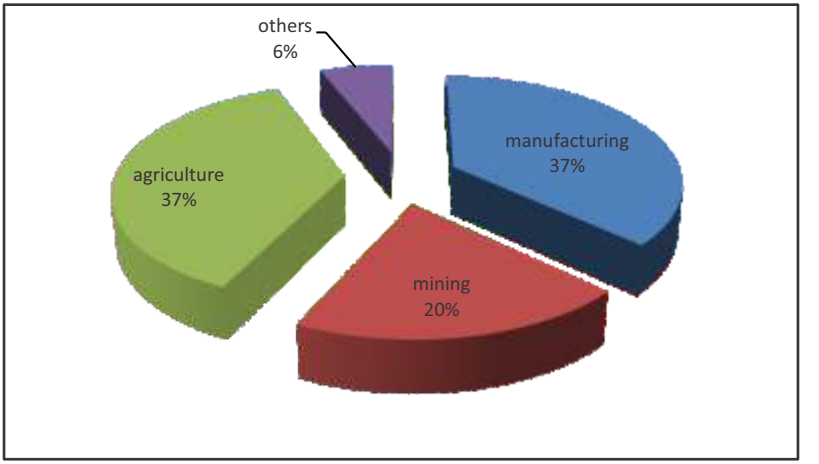
In terms of foreign exchange earnings per unit of GDP, mining generates the most foreign exchange earnings to the economy. The sector contribution to exports has increased significantly from 20% between 1993 and 2003 to 43% between 2004 and 2011. In 2011 alone the sector contributed USD2.3 billion to national exports, representing far above 50% of the country's total merchandise exports and the country's total foreign exchange earnings.

Zimbabwe mining exports (1980-2012)

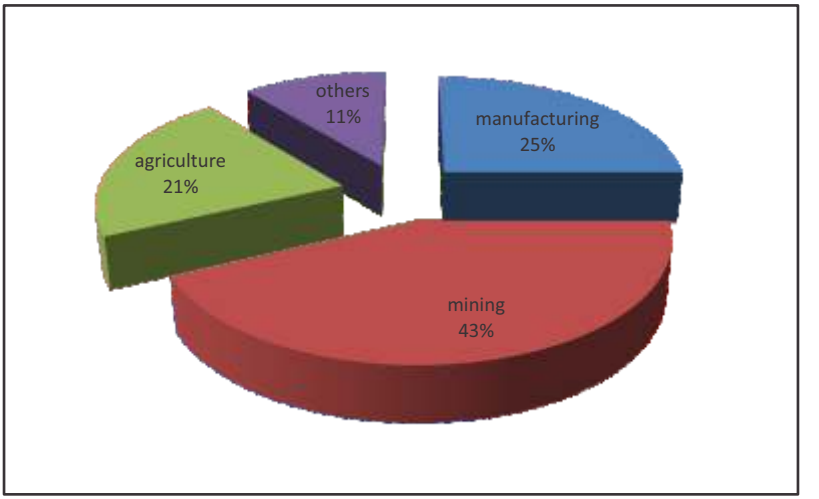


Source: MOF, RBZ

Sectoral contribution to total exports (1993-2003)

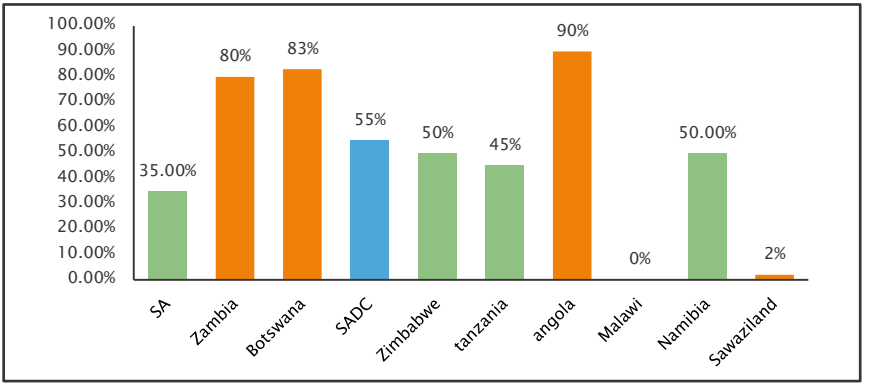


Sectorial contribution to total exports (2004-11)



Source: MOF

Mining contribution to exports: regional comparison



Source: Various Country Statistics

4. Contribution to Fiscal Revenue

The growth of the sector has seen its contribution to fiscal revenue increasing from 5.78% in 2009 to 7.2% and 12 % in 2010 and 2011 respectively.

Mining sector Contribution to Total Revenue

($ '000)	2009	2010	2011 (estimate)
Total Tax Paid Directly by Mining sector to government	57,800	167,523.8	340,300
Direct mining contribution to total government revenue %	5.78%	7.2%	12%

**The above figures exclude diamond payments*

Source: Deloitte Tax Study 2012, COMZ

In 2011 the total tax paid by the mining sector to the government is estimated around US$340 million representing about 12% of the revenue collected by government for the year (2011). If one incorporates alluvial diamond the contribution increases to around 18%. The contribution in various taxes include royalty, corporate income tax, VAT, customs duty, PAYE, Marketing Commissions (MMCZ), capital gains tax, local authority charges, EMA charges, licence fees/registration fees among other charges.

Revenues to the State from mining companies in 2011 were disaggregated as follows:

Fiscal Revenue from Mining

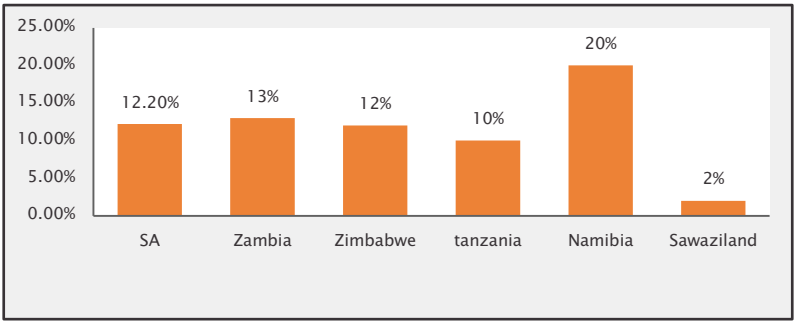
Tax	Total Revenue	Revenue from Mines	Per Cent contribution by mines
PAYE	480 000 000	87 400 000	18%
Corporate Tax	296 000 000	45 600 000	15%
Royalties	83 400 000	83 400 000	100%
Customs Duty	334 000 000	26 700 000	8%
Other VAT, WHT, payment to local authorities etc	1 406 000 000	97 200 000*	7%
Total	2 600 000 000	340 300 000	12%

Source: Deloitte Tax Study 2012, COMZ

While the absolute figure of $340million contributed by the mining sector to total fiscal revenue in 2011 may appear small relative to the total revenue (export receipts) it is important to note that the mining sector is still experiencing high cost of production, chunking approximately 72% of the total revenue. This leaves about 28% to be shared between the

government and the shareholder of which the government currently takes around 60% of that 28%. Despite the current low capacity levels and high costs of production the sector's contribution to the fiscal revenue is fairly comparable to the sub- region. In SA, Zambia, Tanzania and Swaziland the contribution are 12.2%, 13%, 10% and 2% respectively.

Contribution to Fiscal Revenue: Regional Comparisons



Source: Various Country Statistics

4.1 Fiscal challenges

While the mining industry has great potential to grow and be many times its current size the current fiscal landscape continues to weigh down the maximum output the sector can generate. The sector is vulnerable to a myriad of taxes which include:

Mining Taxes

Royalties	**1%- 15%**
Corporate income tax	25%
	15%
Customs duty	-60%
PAYE	Up to 45%
Capital gains tax	15-20%
Marketing Commissions (MMCZ)	0.875%
EMA charges	2% of gross revenue
Local authority charges	Vary with local authority
Mining licence fees	As per SI 11 of 2012

Source: ZIMRA, MOF

The above taxes and fees currently constitute 17% of mining tax revenue and around 60% of the mining sector profitability before tax. The major concerns about the current fiscal regime are the indiscriminate or fragmented approaches by different government departments in levying charges to mining companies, high royalty rates and the unpredictability of the mining tax regime.

4.2 The prospects of the mining sector contribution to fiscal revenue

The potential maximum contribution of the mining sector to revenue largely depends on the growth and development of the mineral sector. The mining industry (excluding diamonds) requires over US$5-7 Billion dollars in capital to optimize production over the next 5 years. A lot more required is new ventures. Of the above figures Gold requires 33%, platinum 40%, diamonds 11%, coal 8%, Chrome 4%, nickel 4%. If secured the minerals output for key sectors will grow phenomenally as shown below;

Requisite Investments in Mining

Mineral	Minimum Funding Requirement (US$ Bil)	2011 production	Expected production by 2016
Gold	2.3	12,992kg	50 000kgs
PGMs	2.8	10,826kg	21000 kgs
Ferrochrome	0.28	161,838 tonnes	262 000 tonnes
Nickel	0.28	7,992 tonnes	25 000 tonnes

Source: COMZ

Table 33 : Increases in Au and PGM Royalty Rates

	2009	Mid 2010	2010	2011	2012
Gold royalty	3%	3.5%	4%	4.5%	7%
Platinum royalty	3%	3.5%	4%	5%	10%

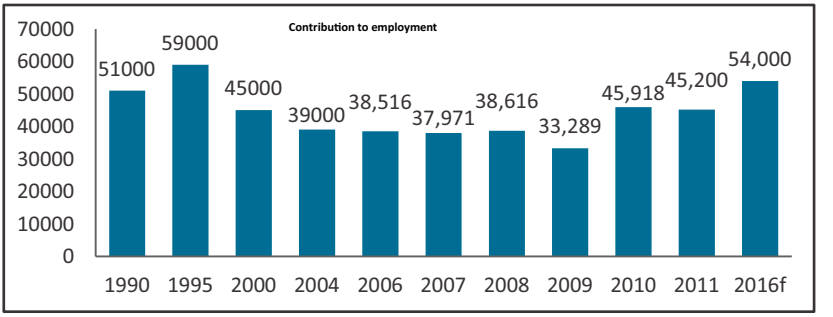
Source: MOF

The platinum industry which has contributed more than 45% of the total sector output in the past 3 years is on an expansion phase and requires capital around $2,8 billion to increase its installed capacity. Despite being profitable the platinum producers in total are currently injecting capital more than double their earnings. With production levels expected to double in the next 3 years the role of the platinum will significantly prop up the sector's contribution to the fiscus. It is against this background that the sector looks forward for a downward review in the current royalty rates to competitive levels in order to quicken the recapitalization process by increasing the amount of earnings to be ploughed back as capital, as well as attracting new external capital.

5. Contribution to employment

The sector directly employed around 45 000 workers in 2011. It is estimated that another 15,000 workers are employed in associated industries that either supply products to, or use products from the mining industry. Over 500, 000 people are directly dependent for their daily subsistence on mining incomes.

Contribution to employment



Source: COMZ

6. Contribution to investments

The sector continues to act as a magnet for investment in Zimbabwe. It directly accounted more than 50% of total fixed investment and more than 75% of the total private sector investment in 2011. If the multiplier effect is taken into account, mining helped generate about 80% of total investment in the economy. The reason for the rise in the contribution of mining is the encouraging recovery in real mining output with more than $5 billion required by the sector in the next 5 years.

7. Mining Sector and Corporate Social Responsibility

The sector continues to support CSR development initiatives that include:

- Primary and secondary schools;
- Hospitals and clinics;
- Community housing schemes;
- Road construction;
- Support for local income generating projects;
- Scholarship programmes; and
- Local Procurement.

The sector has concluded some empowerment deals, which make the mineral resources sector the largest contributor to black economic empowerment.

APPENDIX 5: CHANGES IN MINERAL FEES (2011/2) & COMZ RECOMMENDED FEES

PROVISION	FEES AS AT DECEMBER 2011 (SI 13 OF 2011) US$	FEES AS AT JANUARY 2012 (SI 11 OF 2012) US$	COMZ RECOMMENDED FEES US$	COMMENTS
PRESCRIBED FEES				
Application fee for registration as an Approved Prospector Application for renewal as an Approved Prospector Fee for Duplicate Certificate of registration as an Approved Prospector	1500 250 1500	5 000 1 000	3 000 500 1 500	This is similar to a practicing certificate fee. Even at recommended levels is too high. Indigenous Zimbabwean are mainly involves, at this level barrier to entry is high.
Fee for a Prospecting License Ordinary Special Fee for a duplicate Prospecting License	100 150 150	500 1 000	300 450 150	These are instruments used by indigenous players in mining. If too high then goes against indigenisation programme
Fee for application for registration of Precious metal or Precious stone block Fee for application of registration of a base mineral block Ordinary Special	200 300 500	100 000 precious stones 1 000 000 diamond 500 000 platinum 2 000 4 000	300 300 300	At this stage in the development of projects no income is being generated. Based on principle of standardisation of fees. In line with proposal in Mines and Minerals Amendment Bill to have one type of title
Registration fee for sites	100		100	
Fees for duplicate certificates of registration	300		300	
Application for revocation of forfeiture	500	5 000	2 500	To reduce work for ministry and enforce prudency
Fee for Special Grant application under Part XIX	1000	10 000	5 000	Areas are reserved against prospecting or mining for a reason. Those with justifications to go against such reservations must pay a premium
Annual fee for renewal Special Grant under Part XIX US$ per Ha per year	20	100	20	Fee for renewal of SG are a cost when no income is being generated. Fees already too high
INSPECTION FEES				
Fee for inspection by declaration of work Registered blocks First Inspection US$ per 5 claims Subsequent inspections US$ per 5 claims Mining lease First Inspection US$ per 5 Ha Subsequent inspections US$ per 5 Ha	5 10 5 10	1 000 1 000 1 000 1 000	10 20 10 20	These fees appear small in absolute numbers. However, because of the number of claims that are held that run into thousands for one to make commercially acceptable returns, the effect of high charges increase rapidly. Suggest that we maintain fees at 2011 levels
Inspection by production Precious metal blocks US$ per 5 claims Base mineral blocks Chrome tonnes for every 5 claims Iron Ore tonnes for every 5 claims Limestone tonnes for every 5 claims	ZW$2 000 24 tonnes 60 tonnes 60 tonnes	1 000	1000 24 tonnes 60 tonnes 60 tonnes	This is the value of minerals production necessary to inspect every 5 claims These tonnages are deemed sufficient as minimum work requirements
Fee for inspection by survey US$ for every 5 claims	10	1 000	20	Note 1. The principle regulations state these shall be as per section17 which are recommended at US$20
Fee for inspection of precious metal block without development work US$ per 5 claims or part thereof	10	1 000	20	Note 1
Unit of expenditure equivalent to 10m of development work US$	ZW$300		100	Note 2
Fee for inspection of base mineral blocks by payment US$ per 5 claims	20	2 000	20	Note 1

Protection fee for claims US$ for each period of 2 months for a certificate Fee for protection US$ per 5 claims	**10**	**1 000**	**20** **10**	**Note 3**
Annual fee for Precious stone blocks US$ for every 5 claims Mining leases US$ for every Ha	 10 10	 1 000 1 000	 20 20	Note 1
Fee for inspection of mining leases by production	As for the blocks above			
Fee for inspection of mining leases by making up deficient work by payment US$ per 5 Ha	10	1 000	20	Note 1
Annual fee for alluvial, rubble or dump precious metal claims US$ per 5 claims	10	1 000	20	Note 1
Inspection of mining lease by production Precious metal blocks US$ per 5Ha Base mineral blocks Chrome tonnes for every 5 claims Iron Ore tonnes for every 5 claims Limestone tonnes for every 5 claims	 24 tonnes 60 tonnes 60 tonnes		 100 24 tonnes 60 tonnes 60 tonnes	Provided for under section 26 of the principal regulations RGN 247/1977
OTHER FEES AND CHARGES				
Search fees: US$ per hour	4		5	
Certificate of ownership: US$ per block of claims	15 with a minimum charge of 30		5	
Copies of agreement: US$ per application	30 when prepared by an official 30 when prepared by applicant		30 30	

NEW FEES THAT ARE NOT PROVIDED FOR IN THE MINES AND MINERALS ACT

PROVISION	FEES AS AT JANUARY 2012 (SI 11 OF 2012 US$	COMZ RECOMMENDED FEES US$	COMMENTS
PRESCRIBED FEES			
Fee for a Prospecting License **Ordinary for whole country** **Special for whole country**	 1000 3000	 300 450	These licenses will breed confusion in the registration of mining title.
Registration fees	1 000 000 diamonds 1 000 000 diamond 2 500 000 platinum 500 000 coal 2 000 Chrome 5 000 Chrome Special PL	300 300 300	The law recognises Application fees for registration. The split of these fees into Application Fees and Registration fees makes the applicant pay double for a permit or license
Ground Rentals	3 000 per Ha \year for diamonds 100 per Ha \yr for Coal, CBM, Minerals Oils, Energy Minerals 1 000 per Ha/yr Platinum 300 per ordinary block 3 000 per Special block	100	Ground rentals are the same as fees for inspection of mining titles or mineral exploration Providing for inspection fees and ground rentals is charging twice for the same activity.

Source: Kwesu I 2012, COMZ

APPENDIX 6: MINERAL RESOURCE RENT TAX (RRT) LEGISLATION

(Generic wording adapted from Liberian Revenue Code)

a) *Purpose.* This Clause applies to determine whether a project is sufficiently high-yield to be subject to a RRT (surtax) and, if so, the amount of tax.

b) *Definition of High-Yield.* A project is considered high-yield and thus subject to surtax when the project's pre-tax rate of return on total investment is greater than (Treasury Bond rate +700 basis points?) percent, the threshold rate of return for application of this Clause. The Treasury Bond rate that has maturity nearest to 10 years at the end of the fiscal year, plus 700 (?) basis points. If no Treasury Bond Rate is available, then the applicable threshold rate of return shall be 20 (?), percent until a Treasury Bond is issued.

c) *Method to Calculate Yield.* A project's accumulated negative net cash flow shall be determined by applying an annual accumulation factor of 1 +threshold rate/100 to the negative net cash flow carried forward from a prior tax period. At the close of each tax period, accumulated negative net cash flow carried forward from the prior period shall be increased by current negative net cash flow or offset by current positive net cash flow. A project is not high-yield and subject to surtax unless it's accumulated net cash flow at the close of a period is positive.

d) *Surtax Rate.* Positive net accumulated cash flow at the close of a tax period is taxable at a rate of 50 (?) percent and the amount of this liability is deductible from gross income for the tax period.

e) *Re-Set Accumulation to Zero.* Following a tax period for which tax is due under this section, a project's accumulated negative cash flow is re-set to zero and the method of subsection (d) is re-applied using zero as the starting point for the succeeding tax period.

f) *Steps to Calculate Yield.* Beginning with the first tax period in which a project has begun construction, the following steps are used to calculate yield in accordance with subsection (d).

(1) *Cost.* State the expenditures, as specified below, for the tax period. This is the project's cost through the close of the period. Go to Step 2.

(2) *Revenues.* State the project's revenues, as specified below, for the tax period, including revenues, if any, from the exploration period. This amount is the project's revenues through the close of the period. Go to Step 3.

(3) *Test Net Cash Flow.*

(A) **Determine net cash flow.** Subtract from revenues the amount of cost to arrive at net cash flow (R – C = NCF).

(B) **Net cash flow zero or negative.** If net cash flow is zero or negative, the project is not yet a high-yield project and the surtax does not apply. Multiply the negative net cash flow by 1 + threshold rate/100 to arrive at the project's accumulated negative net cash flow to be carried to the next tax period. Go to Step 4.

(C) **Net is positive.** If net cash flow is positive, tax is determined under subsection (e), and this amount is deductible in determining taxable income (below). Accumulated negative net cash flow is re-set to zero in accordance with subsection (f). Go to Step 4.

(4) *Reprise.* Re-apply steps (1) through (3) for each succeeding tax period, beginning with the period after the one tested under Step 3—

(A) Add costs incurred in the succeeding period to any accumulated negative net cash flow carried from the prior period (zero if re-set) as under Step 1. Go to (B).

(B) State revenues for the succeeding period as under Step 2. Go to (C).

(C) Test net cash flow as under Step 3.

Determination of Expenditures for RRT Purposes

(a) *Expenditures Counted.* For the purposes of determining cost under Section (f)(1), a project's expenditures for a tax period is the sum of the following amounts incurred during the period, and does not include the amount of any income tax paid:

(1) Expenses deductible in computing taxable income, but not the allowance for depreciation or interest and finance charges;

(2) Capital expenditures to acquire or construct a tangible or intangible asset for use in mining operations; and

(3) Exploration, development, and capital goods expenditures as defined in [the nation's] Tax Law. For a project's first tax period, include expenditures for prior exploration, development, and capital goods attributable to the project under [the nation's] Tax Law.

(b) *Transfer of Interest.* Consideration paid for transfer of an interest in the project is disregarded in determining the project's total expenditures.

(c) *Only Production Expenditures.* If an amount referred to in subsection (a) is attributable to commercial production and some other non-production activity of the project, only the amount attributable to commercial production is included in determining the project's total expenditures.

Determination of Total Revenues for RRT Purposes

(a) *Revenues Counted.* For purposes of the RRT clause, a project's total revenues for a tax period are the sum of the following amounts:

(1) The project's gross income for income tax purposes for the tax period, including amounts from hiring or leasing-out property or the granting of rights to use property (but not including interest income);

(2) The project's consideration received for the tax period for the disposal, destruction, or loss of any property (including materials, equipment, plant, facilities, and intellectual property or rights) used in mining operations if the expenditure incurred in acquiring the property was deducted in computing the project's net cash flow for any tax period;

(3) Any amount received for the tax period for provision of information or data obtained from any survey, appraisal, or study relating to mining operations, if the expenditure incurred in undertaking the survey, appraisal, or study was previously deducted in computing the project's net cash flow for any tax period;

(4) Any other amount received for the tax period that is a reimbursement, refund, or other recoupment of an amount previously deducted in computing the net cash flow of the project for any tax period; and

(5) If property used in mining operations has been destroyed or lost, any compensation, indemnity, or damages the project received in respect of the property under an insurance policy, indemnity agreement, settlement, condemnation action, or judicial decision.

(b) *Transfer of Interest.* Consideration received for transfer of an interest in the project is not included in a project's total revenues.

(c) *Only Production Revenues.* If an amount referred to in subsection (a) is attributable to commercial production and some other non-production activity of the project, only the amount attributable to commercial production is included in determining the project's total revenues.

APPENDIX 7: CHANGING STRUCTURE OF THE MINING INDUSTRY: 1994 & 2011

Mineral	Company	Main Owner 1994	Main Owner 2011	Operations 1994	Capacity '94
Asbestos	Shabanie and Mashaba Mines (Pvt.) Ltd.	African Associated Mines Pvt. Ltd., 100%	Local	Shabanie Mine, Zvishavane; Gaths and King Mines,	300
Coal	Wankie Colliery Co. Ltd.	Private investors 60%, Government 40%	Govt 60%	Hwange	5,000
Cobalttonnes	Bindura Nickel Corp.	Anglo American Corp., 100%	Mwana Africa	Shangani, Madziwa, Trojan, Bindura & Epoch Mines	150
Copper	Mhangura Copper Mines Ltd. MCM	ZMDC 54.56%	ZMDC (shut)	Mhangura Mine	16
Copper	Lomagundi Smelting & Mining (ZMDC)	ZMDC	ZMDC (shut)	Alaska Smelter &Refinery	35
Diamond ct	Auridam Zimbabwe Ltd.	Auridam Consolidated, 50%; Redaurum Red Lake Mines 50%	Local investors	River Ranch Mine,	50,000
Diamond ct	(Murowa)	NA	Rio Tinto Plc, 78%, & RioZim Ltd., 22%	Murowa	NA
Diamond ct	(River Ranch)	NA	Local investors	River Ranch	NA
Diamond ct	(Marange)	NA	Canadile Miners (Core Mining Ltd. & Marange Resources Pvt Ltd.)	Marange	NA
Diamond ct	(Marange)	NA	Mbada Mining (Grandwell Holdings Ltd. & Marange Resources Pvt Ltd.)	Marange	NA
Gold kg	Rio Tinto Zimbabwe Ltd.	RTZ Corp. plc., 56%	RioZim local	Renco, Patchway, Brompton Mines, Cam-Motor dump	2,800
Gold kg	Cluff Resources Zimbabwe Ltd.	Cluff Resources plc, 82.4%	Mwana Africa	Freda Rebecca Mine	2,500
Gold kg	Independence Mining Pvt. Ltd.	Lonhro plc, 100%	Metallon Plc	How, Athens, Tiger Reef, Redwing & Shamva Mines,	3,300
Gold kg	Falcon Gold Zimbabwe Ltd.	Falcon Investments S.A., 71.7%	New Dawn 80%	Dalny Mine, Venice Mine, Golden Quarry Mines	2,000
Gold kg	Corsyn Consolidated Mines Pvt. Ltd.	Lonrho plc, 100%	Metallon Plc	Anzac, Arcturus, Mazowe, Muriel Mine,	1,500
Gold kg	ZMDC	Government, 100%	Government, 100%	Sabi Mine, Elvington Mine,	800
Gold kg	Jena Mines Ltd.	ZMDC 50% Trillion Resources, 50%	ZMDC	Jena Group,	400
Gold kg	Masasa Mines	Delta Gold NL, 100%	?	Giant tailings dump,	100
Iron and steel	Zimbabwe Iron and Steel Co. Zisco	Government, 92%	Zisco – Essar?	Redcliff,	1,000
Iron ore	Buchwa Iron Mining Co Bimco	Zisco, 100%	Zisco – Essar?	Buchwa West Mine, Ripple Creek Mine,	1,400
Ferroalloys: HC FeCr	Zimbabwe Mining and Smelting Co. Pvt Ltd. Zimasco	Union Carbide Zimbabwe, 100%	Zimasco Consolidated Enterprises Ltd. (ZCE) Sinosteel 86%, CAD Funf 14%	Peak Mine, Railway Block Mine, Smelter at Kwekwe	178
LC FeCr	Zimbabwe Alloys Ltd. Zimalloys	Anglo American Corp., 100%	Benscore Investments local	Smelter at Gweru	35
FeCrSi	Zimbabwe Alloys Ltd. Zimalloys	Anglo American Corp., 100%	Benscore Investments local	Smelter at Gweru	28
Lithium	Bikita Minerals Pvt. Ltd.	Private, 100%	Local	Bikita Mine,	33
Nickel	Trojan Nickel Mines	Bindura Nickel Corp., 100%	Mwana Africa	Shangani, Madziwa, Trojan, and Epoch Mines	17
Nickel	BSR Ltd.	Bindura Nickel Corp., 100%	Mwana Africa	Smelter & refinery at Bindura Empress	16
Nickel	Rio Tinto Zimbabwe Ltd.	Rio Tinto Plc 100%	RioZim	Nickel Refinery,	7
Phosphate	Dorowa Minerals Pvt. Ltd.	Chemplex Corp. Ltd., 100%: AAC	Chemplex	Dorowa Mine,	155
PGMs	(Ngezi)	NA	Impala Platinum Holdings Ltd., 86.9%	Ngezi Mine	NA
PGMs	(Mimosa)	Union Carbide	Aquarius Pt Ltd 50%, Zimplats 50%	Mimosa Mine	NA
PGMs	(Unki)	NA	Anglo Platinum (Anglo American Plc)	Unki Mine	NA
Tin	Kamativi Tin Mines Ltd.	ZMDC, 91%, private, 9%	ZMDC (shut)	Kamativi Mine	1
Vermiculite	Shawa Vermiculite Pvt. Ltd.	Private, 100%	Shawa Vermiculite Pvt Ltd.	Shawa Mine,	39
Vermiculite	Dinidza Vermiculite Mining Co. Pvt. Ltd.	Private, 100%	Dinidza Vermiculite Mining Co.	Dinidza Mine	10

Sources: RMG 2012, USGS 2012 & Media

APPENDIX 8: ZIMBABWE- GOLD PRODUCTION BY MINE & COMPANY

Gold Mines (t)	Status	1975	1985	1990	1995	2000	2005	2010	2011	Controlling company	M1	M2	EBIT 2010*
Arcturus Gold Mine	O	0.690	0.580	0.580	0.600	1.098	1.100	..	..	African Pioneer	Au		0.000
Athens Gold Mine	S	..	..	0.330	0.400	---	---	---	---	African Pioneer	Au		0.000
Attica Mines (Pvt) Ltd	A	0.600	0.600	..	..	..	..	..	..	African Pioneer	Au		0.000
Blanket Gold Mine	O	0.690	0.540	0.640	0.803	1.075	0.700	0.500	1.114	Caledonia	Au		2.497
Cam & Motor Gold Mine	O	0.100	0.140	0.280	0.503	0.263	..	..	..	Riozim	Au		-0.569
Connemara Gold Mine	C	..	..	..	..	0.323	..	..	..	First Quantum	Au		986.000
Dalny Gold Mine	O	1.200	1.490	0.980	1.200	0.556	0.200	..	..	New Dawn	Au		1.303
Elvington Gold Mine	O	---	---	---	0.536	0.500	0.200	..	..	State of Zimbabwe	Au		0.000
Eureka Gold Mine	O	..	..	..	..	0.664	---	---	---	Mmakau	Au		0.000
Forbes & Thompson (Pvt) Ltd	A	0.500	0.800	---	---	---	---	---	---		Au		0.000
Freda Gold Mine	S	..	..	0.140	0.450	..	..	..	..	Forbes & Thompso	Au		0.000
Freda Rebecca Gold Mine	O, E/C	---	---	2.120	2.500	3.489	0.300	0.730	1.308	Mwana Africa	Au		-14.470
Golden Kopje Mine	C	---	0.220	0.260	0.511	0.300	---	---	---	Caledonia	Au		2.497
Golden Quarry Gold Mine	O	..	..	..	..	..	0.200	..	..	New Dawn	Au		1.303
How Gold Mine	O	..	..	0.900	1.200	1.050	1.500	..	..	African Pioneer	Au		0.000
Indarama Gold Mine	S	..	..	..	0.500	..	..	..	..	Yamana	Au		583.480
Inez Gold Mine	S	..	..	..	0.120	..	..	..	..	Mwana Africa	Au		-14.470
Jena Gold Mine	O	---	---	---	0.414	0.400	..	..	..	State of Zimbabwe	Au		0.000
Maligreen oxide Gold Mine	C	---	---	---	---	0.100	..	..	..	Cluff Gold, Pan African	Au		-0.976
Mazowe Gold Mine	S	0.770	0.370	0.420	0.600	0.455	0.250	..	..	African Pioneer	Au		0.000
Metallon Gold Zimbabwe Ltd	A	2.000	3.300	---	---	---	---	---	---	African Pioneer	Au		0.000
Mhangura Copper Mines Ltd	A	0.300	0.200	0.270	..	..	..	..	..	State of Zimbabwe	Cu		0.000
Mimosa Platinum Mine	O	..	..	..	..	..	0.303	0.426	0.447	Aquarius, Implats	Pt	Pd	58.429
Muriel Gold Mine	S	0.690	0.590	0.490	0.450	0.208	---	..	..	African Pioneer	Au		0.000
Ngezi PGM Mine	O	---	---	---	---	---	0.300	0.800	0.700	Implats	Pt	Pd	7225.000
Norman Levin Gold Mines (Pvt) Ltd	A	0.500	0.500	0.600	0.700	..	..	..	..		Au		0.000
Old Nic Gold Mine	O	..	..	..	..	..	0.200	..	..	New Dawn	Au		1.303
Olympus Gold Mines Ltd	A	0.300	..	0.210	..	..	..	..	..	New Dawn	Au		1.303
Patchway/Brompton Gold Mine	S	0.390	0.490	0.530	0.683	0.479	..	..	..		Au		0.000
Redwing Gold Mine	O	..	..	0.970	0.700	1.020	0.500	..	..	African Pioneer	Au		0.000
Reedbuck Gold (Pvt) Ltd	A	..	..	0.350	..	..	..	..	..		Au		0.000
Renco Gold Mine	O	0.500	1.930	1.320	1.478	1.448	0.750	0.554	0.600	Riozim	Au		-0.569
Royal Family Gold Mine	C	..	..	0.200	---	---	---	---	---		Au		0.000

Sabi Consolidated Gold Mines (Pvt) Ltd	A	..	0.430	0.600	..	..	..	..	..	State of Zimbabwe			0.000
Sabi Gold Mine	O	---	---	---	0.311	0.414	..	..	..	State of Zimbabwe	Au		0.000
Shamwa Gold Mine	O	..	..	0.610	0.750	1.117	0.600	..	..	African Pioneer	Au		0.000
Tiger Reef Gold Mine	O	..	..	0.270	0.150	0.354	..	..	..	BioMet	Au		0.000
Turk Gold Mine	O	..	..	..	..	..	0.450	0.420	0.485	New Dawn	Au		1.303
Unki PGM Mine	O	---	---	---	---	---	---	---	0.150	Anglo American	Pt	Pd	10928.000
Venice Gold Mine	C	0.400	0.570	0.700	0.700	..	---	..	..	New Dawn	Au		1.303
Vubachikwe Gold Mine	O	..	..	0.180	0.350	---	..	..	..	Forbes & Thompson	Au		0.000
= total, identified by producer in country		9.630	12.750	13.950	16.609	15.313	7.553	3.430	4.804				0.000
= total national production		11.000	14.690	16.900	24.290	22.000	14.023	9.619	12.994				0.000
*USD millions, data for main controlling company, not just Zimbabwe operation													

Source: RMG database (RMD), 2012

APPENDIX 9: SCHEDULE OF MEETINGS & INTERVIEWS

		Name	Position	Date
	Government			
1.	Ministry of Finance	Ms C. Mhini	Director Revenue	12 June 2012
2.	Zimbabwe School of Mines (Bulawayo)	Mr D. Tusai	Chief Executive Officer	14 June 2012
3.	Ministry of Economic Planning and Investment Promotion	Dr D. M. Sibanda	Permanent Secretary	18 June 2012
4.	The Chamber of Mines of Zimbabwe (COMZ)	Mr D. Matyanga	Mineral Economist	18 June 2012
5.	Fidelity Printers and Refiners	Mr F. Kunaka Mr T. Machaura Mr M. Dube	Refinery Director Company Secretary Senior Gold Buying Manager	11 July 2012
6.	Zimbabwe Mining Development Corporation (ZMDC)	Mr S. Gaihai	Business Development Executive	12 July 2012
7.	Zimbabwe Investment Authority	Mr R. Mubaiwa Mr F. Sagonda Mr. D. Ncomanzi	Chief Executive Officer Marketing and Research Officer Investment Service Officer	16 July 2012
8.	Zimbabwe Geological Survey - Ministry of Mines and Mining Development	Mr M. Hawadi Mr F. Magumbate	Director Deputy Director	31 July 2012
9.	Ministry of Mines and Mining Development	Mr.Charles. S. Tawha	Chief Government Mining Engineer	12 July 2012
	Private Sector			
1.	Bindura Nickel Corporation - Mwana Africa Group	Mr D. Murangari	Managing Director	5 June 2012
2.	New Dawn Mining Corporation	Mr I. R. Saunders	President/Chief Executive Officer	14 June 2012
3.	Bilboes Gold/Gat Investments	Mr V. Gapare		19 June 2012
4.	Metallon Gold	Mr A. Mashingaidze	Group Chief Operating Officer and Vice Chairman of COMZ	5 July 2012

5.	Freda Rebecca Gold Mine/ Gold Producers Association	Mr T. Muganyi	General Manager – Freda Rebecca Gold Mine and Chairperson – Gold Producers Association	9 July 2012
6.	Mimosa Mining Company	Mr H. S. Mashanyare	Executive Director	11 July 2012
7.	Rio Zim (First Meeting)	Mr P. Makuni		13 July 2012
8.	Zimplats	Mr A. du Toit	General Manager - New Business Development	2 August 2012
9.	Rio Zim (Second Meeting)	Mr P. Makuni		2 August 2012
	Other Institutions/Associations/ Independent Consultants			
1.	Institute of Mining Research (IMR)	Mr. L Mulambo Mr. T. Masayi		4 June 2012
2.	Independent Consultant	Prof R. Davies	Economic Consultant	12 June 2012
3.	Associated Mine Workers Union of Zimbabwe (AWMUZ)	Mr T. Ruzive Mr P. Ncube	President Vice President	16 July 2012
	Mine Entra 2012			
1.	Bolt Gas	Mr D. Kavayi	Business Development Manager	25 July 2012
2.	Craster International	Mr V. Matarirano		25 July 2012
3.	Anolle Casting and Engineering	Mr G. Green	Managing Director	25 July 2012
4.	Summary of Mine Entra Proceedings	Mr H. Mashanyare	Executive Director Mimosa Mining Company	26 July 2012
Total				**25**

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