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Zambia 2024 Mining Report

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Contents

Foreword

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The United Party for National Development (UPND) Government has maintained a stable policy environment for the mining sector since coming to power in 2021. This has helped rebuild confidence in the sector and encouraged new investments in both brownfield and greenfield projects. In the UPND's first budget in 2021, the new Government announced ambitious plans to ramp up copper production to three million tonnes per annum by 2031. If Zambia is to meet this target, the Government will need to maintain this enabling environment and tackle broader issues like the country's power deficit so that new and existing mining projects can flourish.

In our 2022 inaugural mining report, we explored the mining sector's history so as to understand the factors that have contributed to the decline in the country's copper output. Our 2023 report focused on the policy changes that have been implemented over the years and their impact on the sector. In this report, PwC's third mining report, we continue to analyse proposed and actual changes to policy that affect the sector, along with the associated risks and benefits.

I would like to take this opportunity to acknowledge and thank the following for their input in this report: Dr Hapenga Kabeta, Permanent Secretary, Ministry of Mines and Mineral Development and the staff of the ministry; the Ministry of Finance and National Planning; the Zambia Revenue Authority; the Zambia Development Agency; the Zambia Statistics Agency; the Bank of Zambia; the Zambia Extractive Industries Transparency Initiative; the Zambia Chamber of Mines; Mfikeyi Makayi and the KoBold Metals team; Norman Mbazima, Anglo Platinum; Dr Sixtus Mulenga, Musamu Resources; and Anthony Malenga, Country Manager, Barrick- Lumwana.

I would also like to acknowledge the staff at PwC Zambia who contributed to the preparation of this report.

We look forward to your feedback.

1. Introduction

The mining sector continues to be a cornerstone of Zambia's economy, contributing significantly to the country's gross domestic product (GDP), tax revenues and export earnings. This report analyses the sector's performance in 2023 and where available, up to August 2024, highlighting recent developments and prospects for the sector. In the report, we investigate key policy changes during this time and assess their potential impact on the sector. Our insights aim to inform stakeholders—policymakers, investors, mining companies and anyone else with interests in the sector —about the current state and future direction of Zambia's mining industry.

Zambia has faced significant economic challenges in recent years. Initially, these challenges stemmed from the country's unsustainable debt burden and the Covid-19 pandemic. Subsequently, geopolitical tensions and conflicts have exacerbated the situation. Now, the devastating consequences of this year's climate-change-induced drought have put further strain on the domestic economy. In addition, there has been a significant decrease in the mining sector's productivity in recent years, which has also had a negative impact on economic growth.

Despite this, mining continues to be an essential contributor to the economy and it is expected that the sector will play a critical role in Zambia's much sought after economic recovery. This expectation is anchored mainly in the following factors:

- **Policy amendments:** policies have been amended to make the sector more attractive for investment and increase the benefits the country and its citizens derive from it.
- **Efforts to resolve issues:** concerted efforts have been made to resolve significant issues in the sector that have impeded production.
- **Positive prospects for new discoveries:** there are positive prospects regarding discoveries of Zambia's primary mineral, copper, and other minerals, especially those linked to the energy transition.
- **Bullish commodity prices:** the price of commodities, especially copper, has remained bullish for a sustained period and is expected to remain elevated for a long time.
- **Growth in other key minerals:** the output of other vital minerals, such as precious stones, has grown, contributing to greater diversity of output.

This report is our third annual mining sector report. In our inaugural 2022 edition, we explored the sector's history to understand the factors that have contributed to a decline in Zambia's mining output in recent years. Our 2023 report focused on understanding policy changes and their effect on the sector's outlook. In this report, we again analyse proposed and actual changes along with the associated risks and benefits.

In preparing our report, we have used data up to December 2023 and, where available, up to August 2024.

2. Mining sector facts and figures

Overview of the mining sector in Zambia

The mining sector in Zambia is dominated by copper mining, which makes a disproportionately large contribution to the industry's output and the country's economy. Furthermore, a few large mining companies are responsible for a significant proportion of this copper output. Most of these assets have been in operation for many years yet remain critical to the sector's fortunes.

The Ministry of Mines and Mineral Development approved 1,840 mining and non-mining rights applications in the year 2023 through its Mining Licensing Committee. To foster efficiency and transparency in issuing licenses to potential miners, an online application platform was introduced at the end of 2023. The table below shows the number of licenses granted by type in 2022 and 2023:

Table 1: Licenses granted by type in 2022 and 2023

S/NO	Description	2022	2023
1	Artisanal mining rights (AMR)	34	275
2	Small scale exploration licenses (SEL)	70	365
3	Large scale exploration licenses (LEL)	79	380
4	Small scale mining licenses (SML)	5	56
5	Large scale mining licenses (LML)	1	10
6	Mineral processing licenses (MPL)	1	25
	Total	190	1111

Source: Ministry of Mines and Mineral Development 2023 Annual Report

The table above shows that, all being equal, mining activities will increase in the coming years.

Ministry of Mines and Mineral Development 2023 Annual Report.

There has been a significant push by the Government to increase output by the mining sector since the UPND came into power in 2021. Most notably, the government announced in its first budget that year, its ambitious target of increasing copper production from around 800,000 metric tonnes a year (at that time) to three million metric tonnes by 2031. The Government said achieving this target depends on factors such as increased output from existing mines, resolving legacy issues that have dampened production at certain mines, promoting the discovery of new assets, and increasing the contribution of small-scale and artisanal miners.

The production of other minerals, such as precious metals and gemstones, as well as minerals needed for the energy transition, such as lithium, manganese and cobalt, is expected to increase as exploration is intensified.

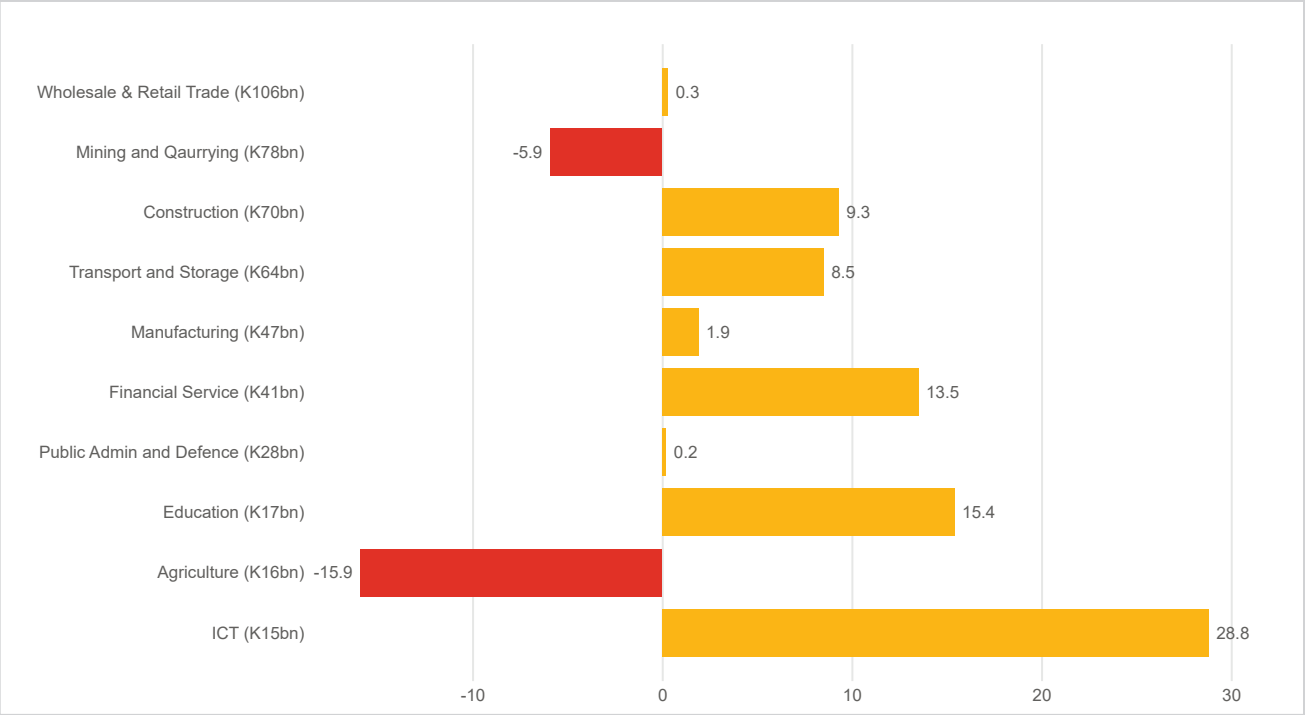
The next section analyses the most fundamental aspects of the sector's performance and overall economic contribution.

2.1 Overall mining sector contribution to Zambia's GDP

According to the Ministry of Finance and National Planning, the mining sector's contribution to GDP in 2023 was 13.7% compared to 12.9% in 2022. In the first quarter of 2024, the sector contributed 15.6% to Zambia's total economic output. Mining ranked as the second largest contributor to Zambia's GDP in 2023 and in the first quarter of 2024. Within the mining sector, GDP contracted by 5.9% in 2023, but the sector grew by 9.6% in the first quarter of 2024. Since 2012, mining's contribution as a percentage of Zambia's GDP has ranged between 11% and 19%, with the peak of 19% recorded in 2021.[1]

In 2024, the sector's performance is anticipated to improve, driven by increased production and ongoing efforts to resolve operational challenges at critical mining operations, such as Konkola Copper Mines. Production at Konkola has fallen sharply since it was placed under liquidation in 2019 following an application by ZCCM-IH. In September 2023, the company was returned to its majority owner, Vedanta Resources, on condition that the Indian company invest some US$1.2 billion in Konkola's operations, and a ramp up in production is expected soon.

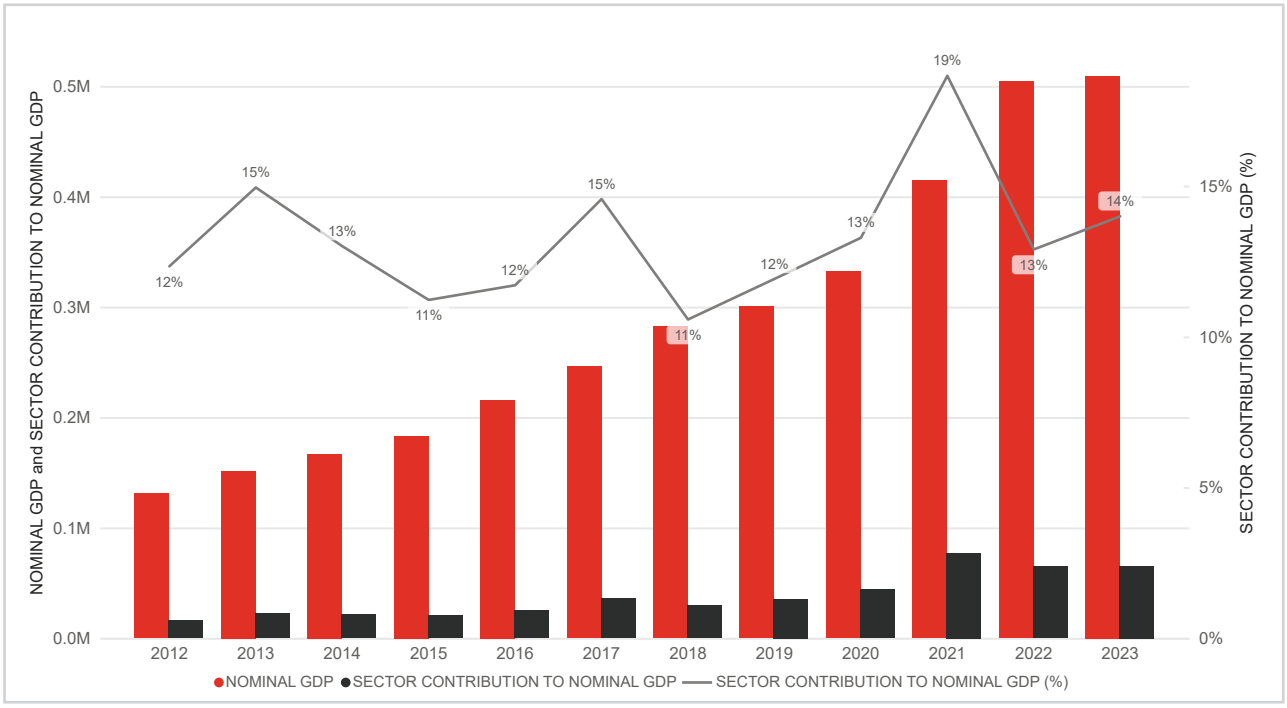
Figure 1: 2023 Sector contrubution to real GDP - %



Source : Ministry of Finance and National Planning 2023 Annual Economic Report.

[1] Ministry of Finance and National Planning 2023 Annual Economic Report.

Figure 2 : Mining Sector Contribution to GDP K'million



Source: Ministry of Finance and National Planning 2023 Annual Economic Report.

2.2 Mining production output and commodity prices

2.2.1 Copper

Production

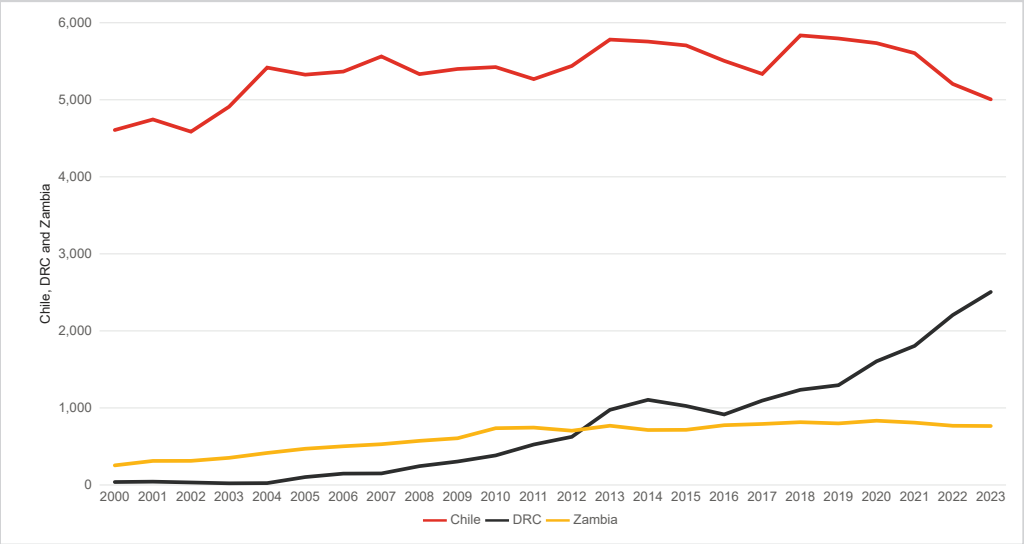
In 2023, Zambia produced 698,566 tonnes of copper, which was a 7.9% reduction on the 763,500 tonnes produced in 2022.[2] This continued the downward production trend witnessed in recent years. According to the United States Geological Survey Mineral Commodity Summaries Report, Chile, the world's largest copper producer, also experienced a reduction in output, with production falling 330,000 tonnes from 5.3 million tonnes in 2022 to 5 million tonnes in the year. In contrast, copper production in the Democratic Republic of Congo (DRC) increased from 2.35 million to 2.5 million tonnes in 2023. This trajectory is expected to continue. It is anticipated that the DRC's Ivanhoe-owned Kamoa-Kakula Copper Complex,[3] which is expected to be the world's fourth largest copper mining operation by the end of this year, will ramp up the country's copper production from 393,551 tonnes in 2023 to an annual output of 600,000 tonnes by the end of 2024.

[2] Ministry of Mines and Minerals Annual Report 2023.

[3] https://www.ivanhoemines.com/what-we-do/operations-projects/kamoa-kakula-mining-complex/

The graph below shows Zambia's production output compared with other copper producing countries, Chile and the DRC.

Figure 3: Annual copper output for Zambia, Chile and the DRC



Source: US Geological Mineral Commodity Summaries

A summary of global copper production in 2023 compared to 2022 by country is as follows.

Table 2: Global copper production in 2023 compared to 2022 by country

Rank	Description	2023	2022	Change
1	Chile	5,000	5,330	-6%
2	Peru	2,600	2,450	6%
3	DRC	2,500	2,350	6%
4	China	1,700	1,940	-12%
5	United States	1,100	1,230	-11%
6	Russia	910	936	-3%
7	Indonesia	840	941	-11%
8	Australia	810	819	-1%
9	Mexico	750	754	-1%
10	Zambia*	698	764	-9%
11	Kazakhstan	600	593	1%
12	Canada	480	520	-8%
13	Poland	400	393	2%
	Other countries	3,100	2,850	9%
	World total (rounded)	22,000	21,900	0%

Source: US Geological Mineral Commodity Summaries

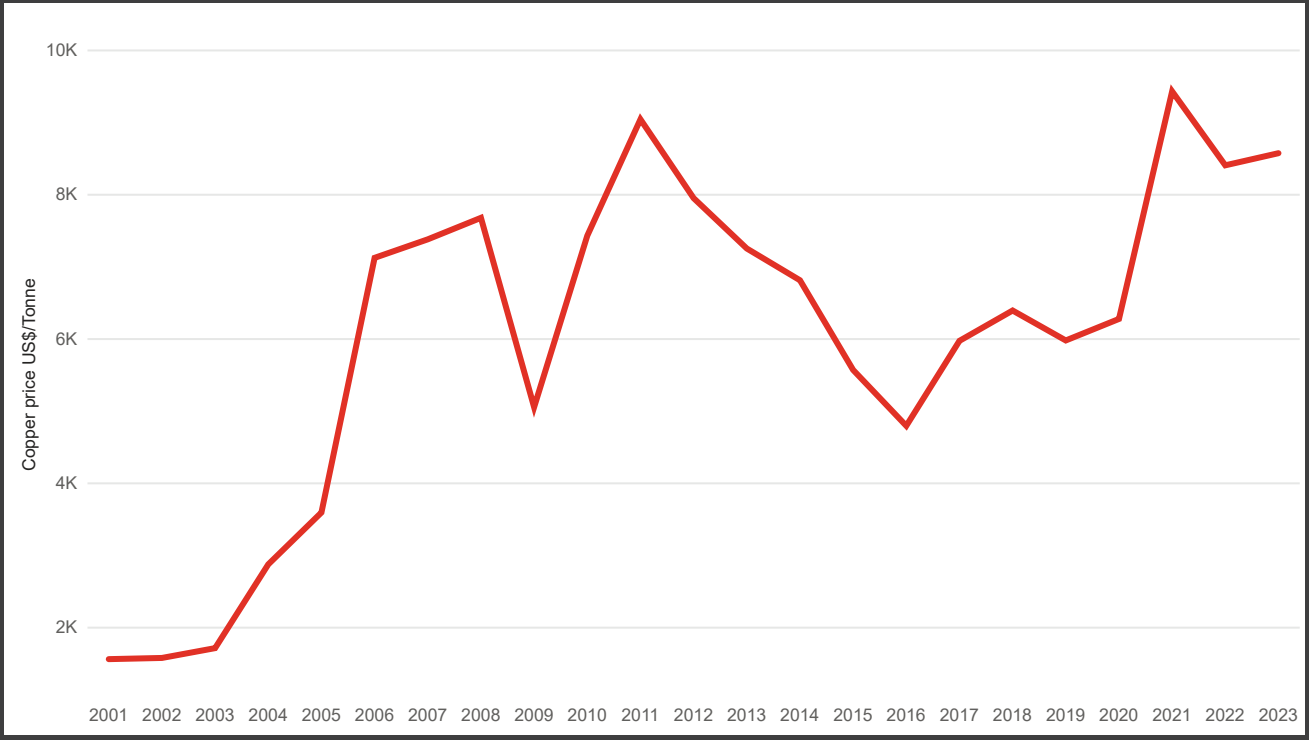
[4] US Geological Mineral Commodity Summaries.

The first quarter of 2024 showed some recovery in copper production, with Zambia producing 165,984 tonnes of copper, an increase of 14.9% compared to the first quarter of 2023 when 144,453 tonnes were produced. However, this outturn was 4.7% lower than that of the fourth quarter of 2023. Overall, Zambia is yet to see sustained quarter-on-quarter growth in production.

Copper prices

Copper prices have remained robust in 2023 and 2024, reflecting strong market demand. In 2023, the average price of copper was US$8,490 per metric tonne. This upward trend continued into 2024, with the price reaching US$9,390 per metric tonne by the end of June. This is a significant increase compared to the average price of US$8,822 per metric tonne recorded in 2022.

Figure 4: Copper Prices



Source: Bank of Zambia.

2.2.2 Cobalt

Production

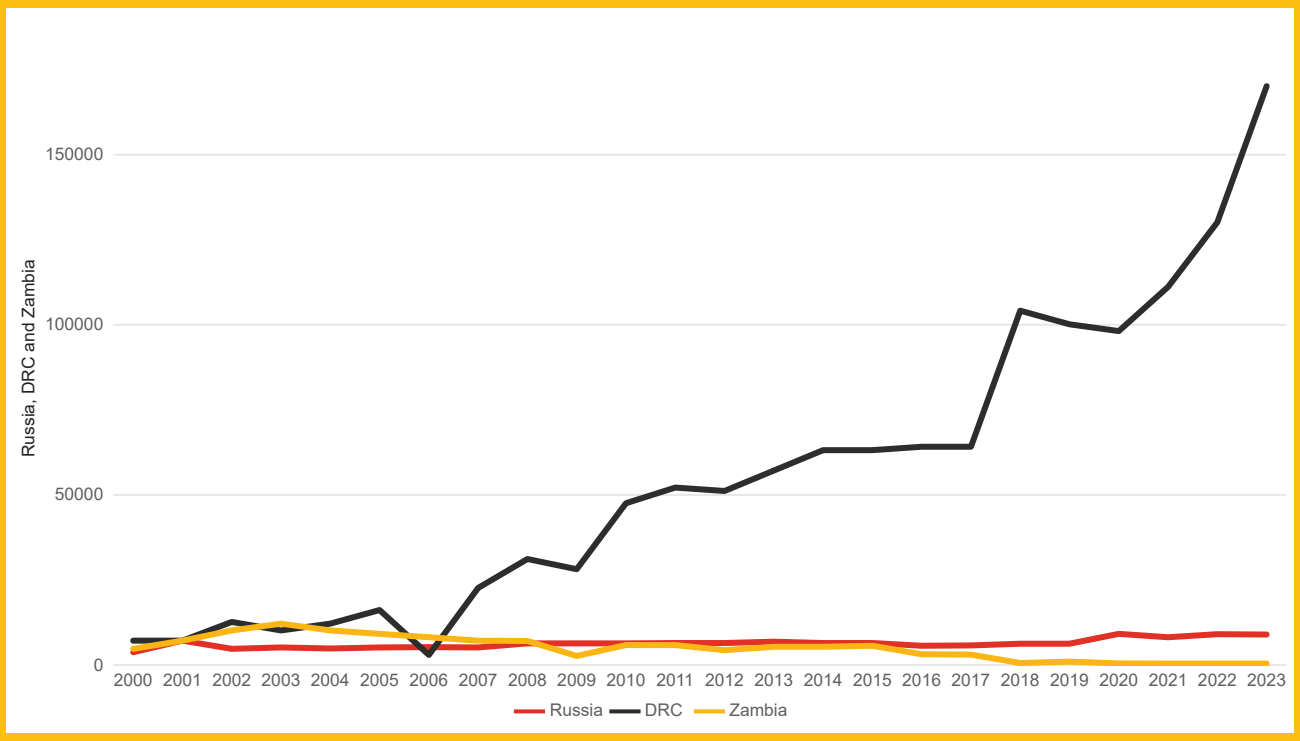
Cobalt production decreased by 17.4% to 207 tonnes in 2023 from 251 tonnes in 2022 (Source: 2023 Annual Economic Report, Ministry of Finance and National Planning). The reduction in production was due to reduced copper production, from which cobalt is a by-product.[5]

In 2022, Zambia signed a memorandum of understanding with the DRC that would allow the two countries to develop jointly a supply chain for electric vehicle batteries.

Zambia's cobalt production has remained relatively stable since 2018. In contrast, cobalt output in the DRC has risen sharply and the DRC continues to dominate global cobalt production, contributing around 70% of the world's supply in 2023.

[5] Ministry of Finance and National Planning 2023 Annual Economic Report

Figure 5: Annual Cobalt Production: Zambia, Russia, and DRC (MT)



Source : US Geological Mineral Commodity Summaries.

The table below shows Zambia's annual cobalt production (in tonnes) relative to the world leader, the DRC.

Table 3: Zambia's annual cobalt production (in tonnes) compared to the DRC.

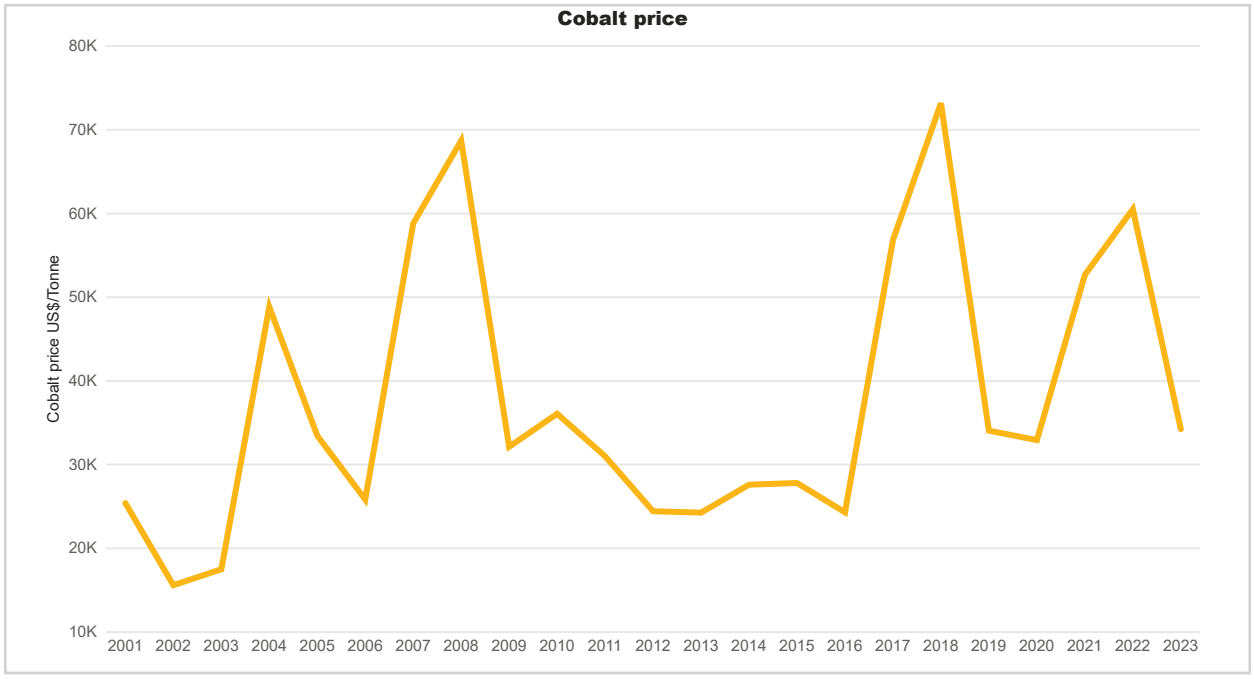
Year	Zambia	DRC	Zambia/ DRC
2019	378.9	100,000	0.38%
2020	316	98,000	0.32%
2021	246.8	120,000	0.21%
2022	251.1	144,000	0.17%
2023	207	170,000	0.12%

Source: Ministry of Mines and Mineral Development 2023 Annual Report

Cobalt prices

In contrast to copper, cobalt prices experienced a notable decline in 2023. The average price of cobalt dropped from US$63,739 per metric tonne in 2022 to US$55,000 per tonne in 2023. This downward trend persisted into 2024, with the price decreasing to US$26,401 per metric tonne as of July.

Figure 6: Cobalt Prices



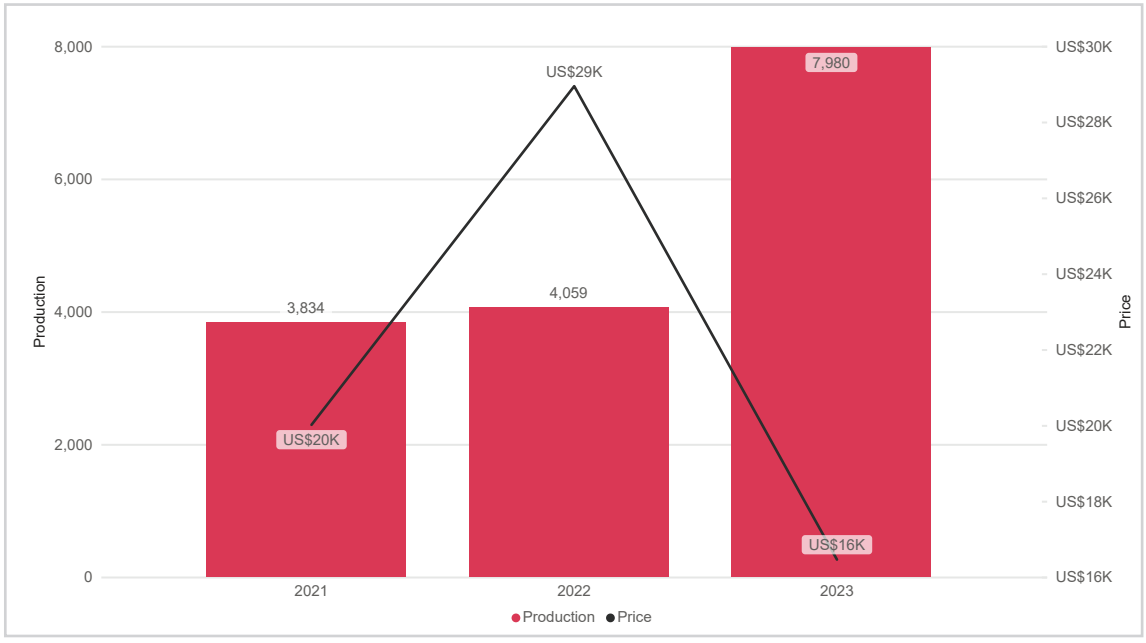
Source: Bank of Zambia.

2.2.3 Nickel

Production

Nickel production in Zambia increased by an impressive margin in 2023 compared to previous years. The Munali Nickel deposit in Mazabuka District and the Enterprise Nickel deposit in Kalumbila District were critical contributors to this growth. Nickel production increased by 96.6% from 4,059 tonnes in 2022 to 7,980 tonnes in 2023. It is worth noting that nickel production in 2024 is expected to rise further as the Enterprise Nickel project moves into full-scale production.[6]

Figure 7: Nickel production (tonnes) and price (US$)



Source: Ministry of Finance and National Planning 2023 Annual Economic Report.

[6] Ministry of Finance and National Planning 2023 Annual Economic Report.

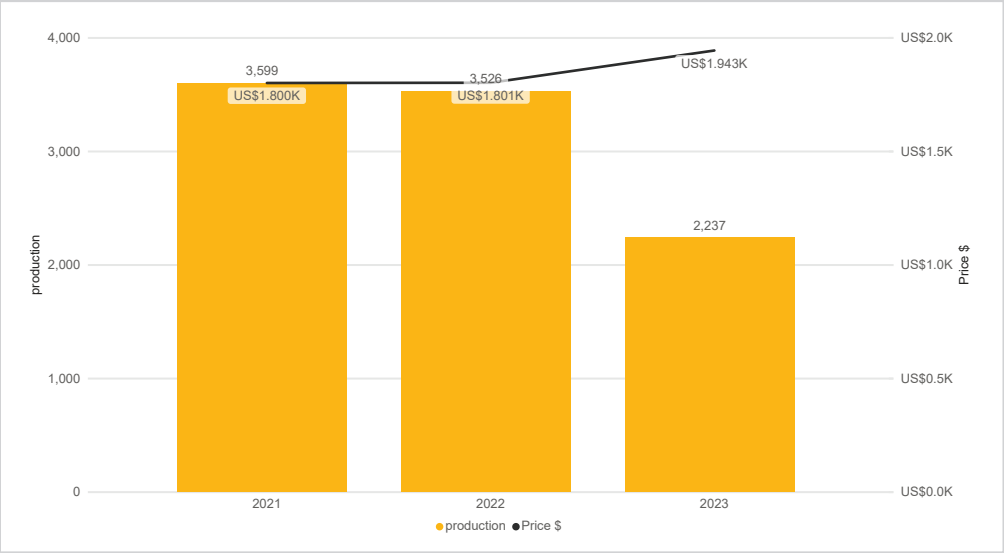
2.2.4 Gold

Production

In 2023, gold production decreased by 36.5% to 2,237kg from 3,526kg in 2022. This reduction is attributed to low ore grades.

Zambia Gold Company is the company charged with driving the formalisation and growth of the gold sub-sector. The ongoing development of gold marketing centres by the Ministry of Mines and Mineral Development is expected to stimulate growth and enhance transparency in this sub-sector.

Figure 8: Gold production (kg) and price (US$)

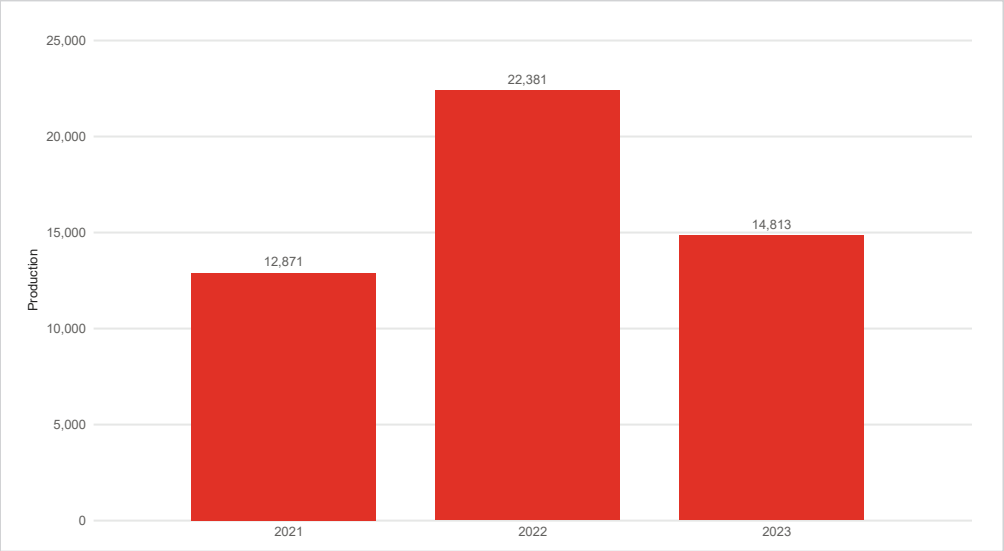


Source : Ministry of Finance and National Planning 2023 Annual Economic Report.

2.2.5 Emeralds

Gemstones, particularly emeralds, are playing an increasingly significant role in Zambia's mining sector output. The Ministry of Mines and Mineral Development has been actively promoting the exploitation of non-traditional minerals such as gemstones to diversify the mining sector. It is expected that precious stone production will increase as the current geophysical mapping should reveal new discoveries. As reported in the Ministry of Finance and National Planning's *2023 Annual Economic Report*, emerald production fell by 33.8% in 2023 to 14,813kg from 22,381kg in 2022.[7]

Figure 9: Emeralds Production (kg)



Source : Ministry of Finance and National Planning 2023 Annual Economic Report.

[7] Ministry of Finance and National Planning 2023 Annual Economic Report.

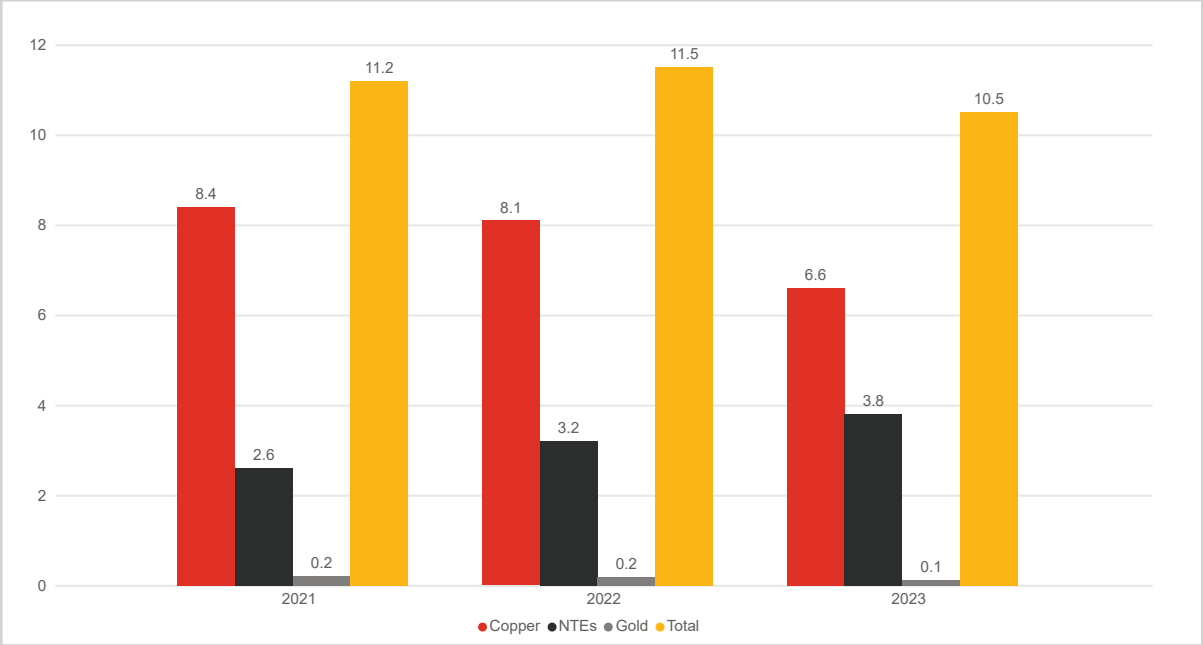
2.3 Mineral export earnings

According to the Zambia Statistics Agency, in 2023, Zambia recorded total export earnings of US$10.5 billion compared to US$11.7 billion in 2022.[8] This represents a 10.5% decrease in export earnings. Copper, cobalt and gold exports accounted for US$6.7 billion of total export earnings in 2023 compared to US$8.3 billion in 2022. During the same period, Zambia's non-traditional exports increased by 20.2% to US$4.2 billion in 2023 from US$3.5 billion in 2022, representing 36% of total exports. Higher electricity, sulfur, cement, lime, iron and steel exports drove the growth in non-traditional exports.[9]

In the first half of 2024, exports rose by 0.3% to US$5.3 billion because of higher production and copper prices. Non-traditional exports decreased by 6.1% to US$1.7 billion mainly due to a reduction in exports of sulphur, cane sugar and re-exports of vehicles, according to the Ministry of Finance and National Planning's mid-year economic Review.

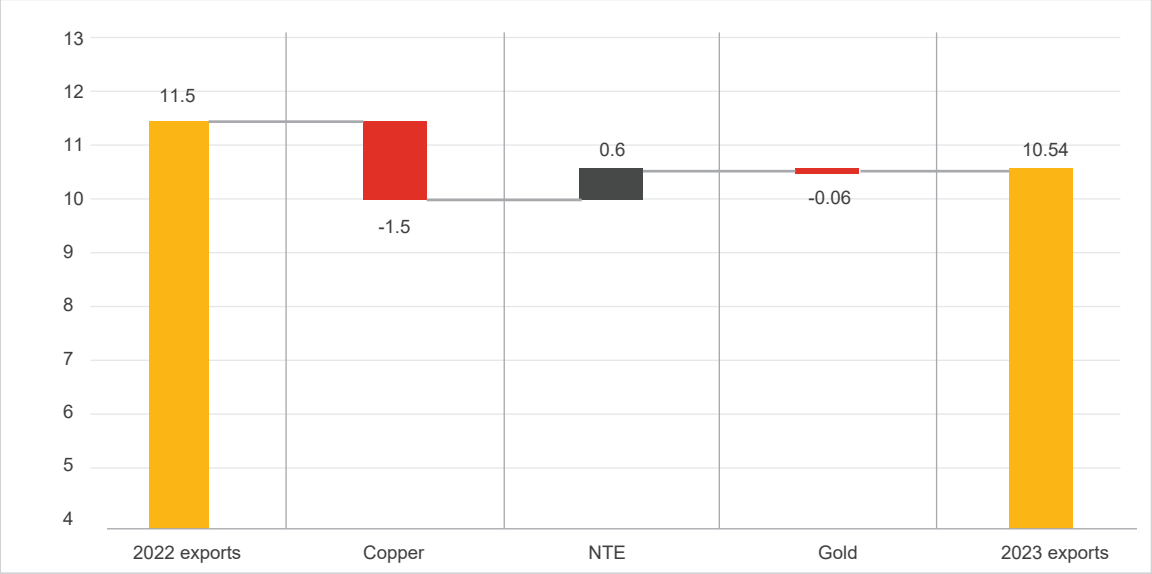
The table below shows total export earnings:

Figure 10: Export Earnings- US$ billion



Source: Zambia Revenue Authority I Bank of Zambia I Zambia Statistics Agency

Figure 11: Export earnings waterfall- US$'billions



Source: Zambia Statistical Agency

[8] Zambia Statistical Agency I [9] Zambia Revenue Authority

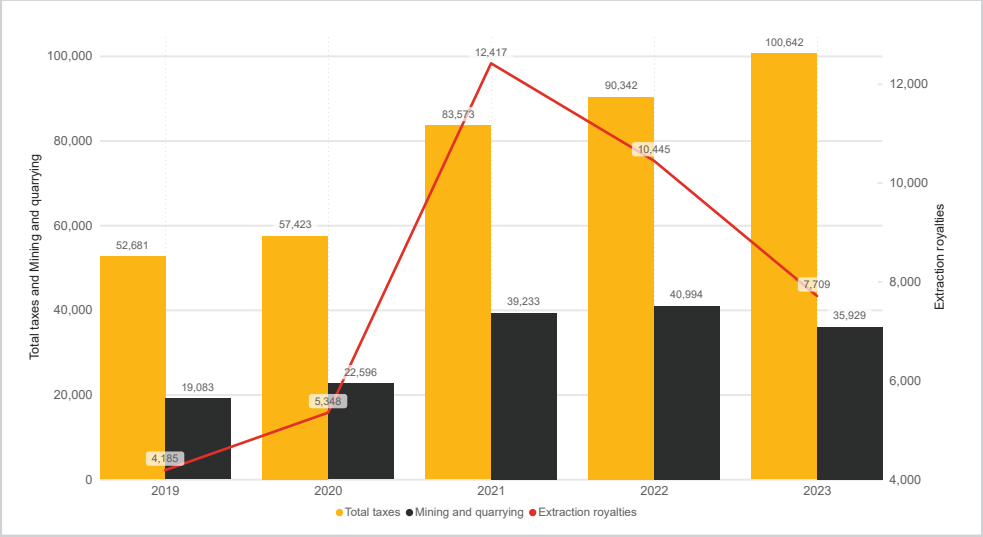
2.4 Mining and quarrying's contribution to tax revenues

A critical measure of the sector's contribution to the economy is the percentage of domestic taxes generated by mining. When corporate taxes and mineral royalties are combined, figures published by the Zambia Revenue Authority (ZRA) show that mining is the most significant contributor to the treasury, contributing 43.37% of tax revenues in 2023,[5] despite a reduction of K7.8 billion in collections compared to 2022. In 2023, K43.6 billion was collected compared to K51.4 billion in the previous year. Despite the lower amount generated in 2023, the mining sector remains the most significant contributor to the treasury.

According to the ZRA, copper prices surpassed projections in 2023, averaging US$8,482 per tonne compared to the ZRA's forecast of US$7,914 per tonne. However, the benefits of higher copper prices were offset by reduced copper production levels due to low copper ore grades and operational challenges at several major mines.[10] In 2023, revenue collection from mining company income tax, mineral royalties and export duty on mineral concentrates (core mining taxes) stood at K13.1 billion against the initial target of K21.9 billion, which together accounted for a deficit of K8.7 billion, representing 91.1% of the total negative performance throughout the year. Lower copper production leads to lower tax revenue and reduced foreign exchange earnings, which in turn leads to poorer economic performance.

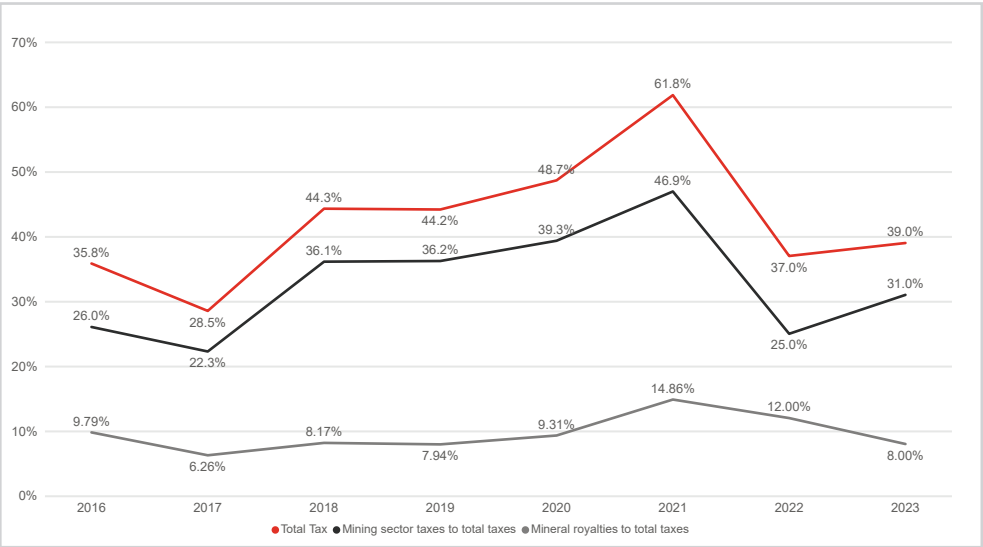
The graphs below illustrate total taxes, and the contribution extraction royalties and the mining and quarrying sector contribute to total taxes. Mining and quarrying taxes consist of income tax and mineral royalties.

Figure 12: Contribution to Total Tax (K'million)



Source is Zambia Revenue Authority 2023 Annual Report.

Figure 13: Percentage of Mining Tax to Total Tax



Source: Zambia Revenue Authority 2023 Annual Report.

[10] Zambia Revenue Authority 2023 Annual Report.

VAT refunds

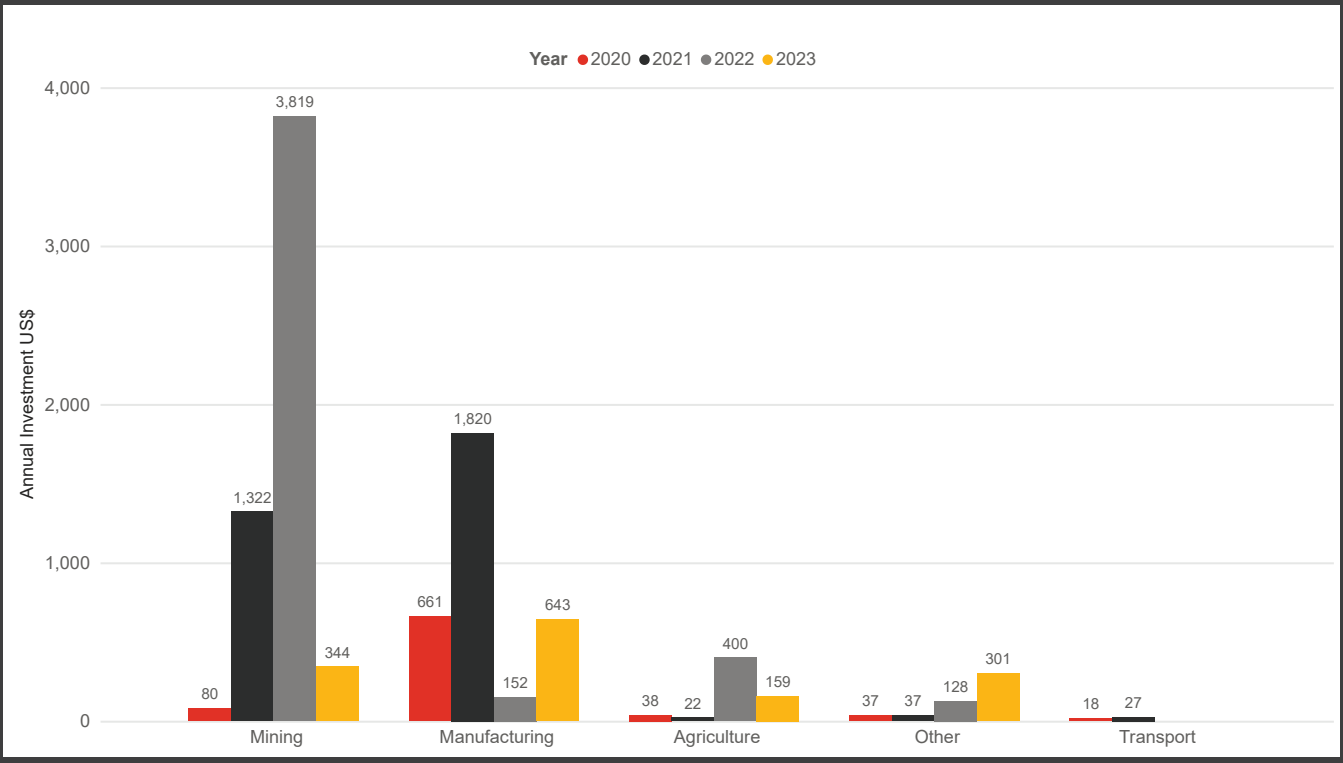
According to the ZRA 2023 annual report, VAT refund claims increased by 10.5% from 13,671 in 2022 to 15,103 in 2023. A total of K16.1 billion was paid in VAT refunds in 2023, compared to K16.1 billion in 2022, a reduction of 0.1%. In response to the increase in VAT refund claims, the ZRA decided to exempt large and specialised taxpayers from the withholding VAT mechanism. The ZRA has since reported that the exemption of large taxpayers from withholding VAT has reduced the rate at which VAT refund claims have been accumulating, freeing up the cash flows of the affected taxpayers. Since the exemption was introduced on 1 August 2023, there has been a significant reduction in VAT refunds. A comparison of the performance between 2022 and 2023 reveals a substantial drop in VAT refunds.[11]

2.4 Share of investment

Zambia has seen a significant increase in investments pledged and actualised in the last three years. Committed investments have increased from US$110.7 million in 2020 to US$4.6 billion in 2023. However, actualised investments fell from US$4.5 billion in 2022 to US$ 2.1 billion in 2023, a reduction of 52%. The mining sector's share of total committed investments in Zambia was 11%. The manufacturing sector recorded the highest share of committed investments at 40%, while the energy sector recorded 36%.

According to the Zambia Development Agency's quarter two report,[12] 125 investment projects were recorded in the second quarter of 2024, surpassing the quarterly target of 90 and achieving 138.9% of the quarterly goal. Of the investments recorded, US$2.4 billion was committed, exceeding the quarterly target of US$2 billion. The energy sector led with the highest committed investments, totaling US$1.1 billion. This was followed by the manufacturing, mining, construction and agriculture sectors, which recorded US$711.9 million, US$316.2 million, US$88.6 million and US$79.2 million, respectively. The remaining sectors collectively accounted for US$72.8 million.

Figure 14: Annual Investment Recorded by ZDA US$ Million



Source: Zambia Development Agency

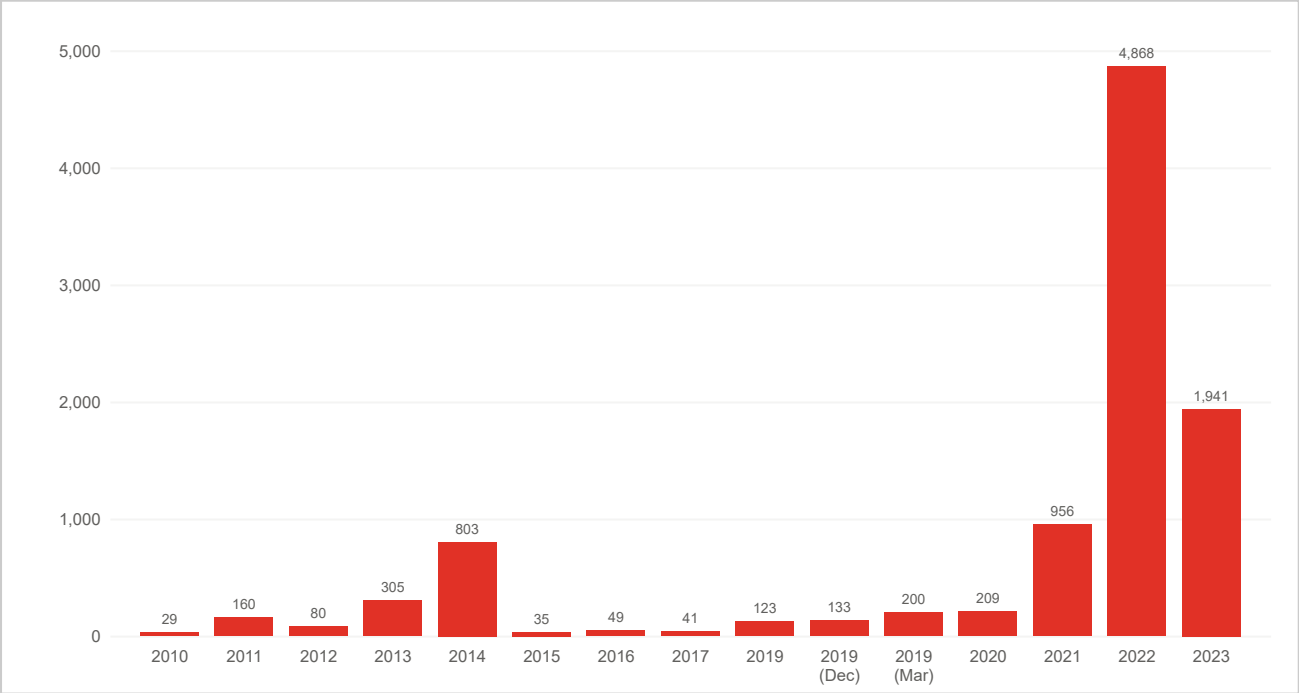
[11] Zambia Revenue Authority 2023 Annual Report.

[12] Zambia Development Agency 2023 Annual Report.

2.5 Mining sector dividends and royalties

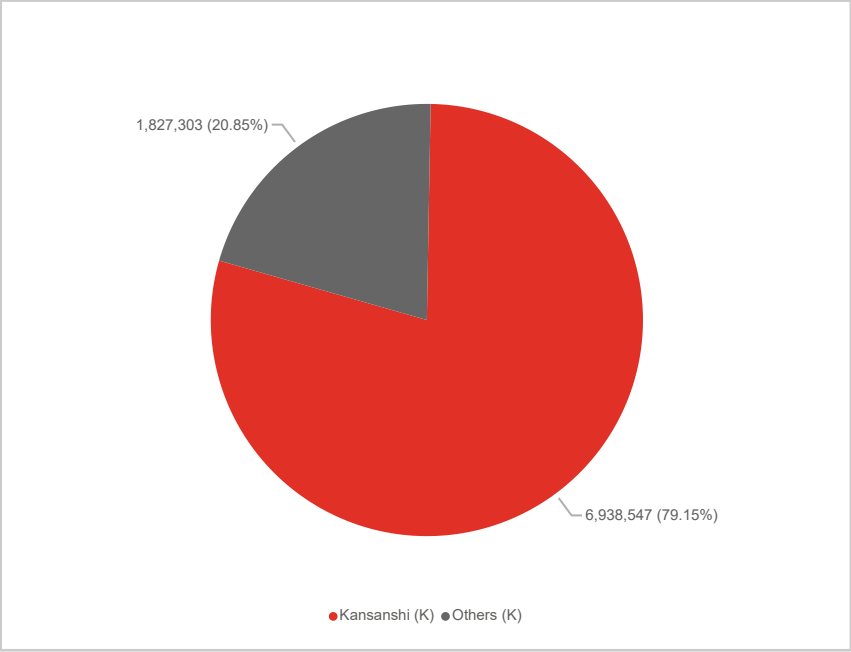
In 2023, ZCCM IH and Kansanshi Mining Plc concluded a royalty agreement that guaranteed the payment of annual royalties equivalent to 3.1% of total revenues generated by Kansanshi to ZCCM IH. The transition arrangements resulted in a special dividend receipt of US$195 million (K4.37 billion) by ZCCM IH in 2022. As the royalty agreement took effect, ZCCM IH received royalties of K1.2 billion (US$56.1 million) and dividends of K170.74 million (US$9.1 million) from Kansanshi Mining Plc. Due to improved performance and a positive equity position, CNMC Luanshya Copper Mines declared dividends of US$30 million, with US$6 million paid to ZCCM-IH (2022: US$70 million was declared). Our analysis of the published ZCCM IH annual reports shows the following trends in the investment income:[13]

Figure 15: Dividends and Royalties Received (K'million)



Source: PwC analysis

Figure 16: ZCCM-IH Dividend and Royalty Returns 2010-2023



Source: ZCCM IH annual reports

[13] ZCCM IH Annual Reports.

3. Significant mining sector developments

3.1 The energy crisis

Zambia's intention to increase copper production to three million tonnes by 2031 will inevitably be impacted by the huge power deficit that the country has faced since early 2024.

Of Zambia's 3,811 MW of installed electricity generation capacity, 84% is from hydro, 9% from coal and the remainder from other sources such as solar. In Zambia, mining is the biggest consumer of energy, accounting for 51% of energy consumption, followed by domestic use, which accounts for 33%. As of August 2024, the country had a power generation deficit of 1,381 MW (Source: Ministry of Energy statement, August 2024). This has resulted in stringent power rationing on an ongoing basis.[14]

The productivity of the whole country has been affected by the power deficit. In response, various players in the mining sector have made their own arrangements to meet their power requirements from neighbouring countries such as Namibia and Mozambique, usually at a higher cost. This increased cost of power will result in subdued profits and lower tax contributions from mining companies.

On 13 February 2024, the Ministry of Energy launched the Integrated Resource Plan (IRP), a comprehensive strategy document designed to secure a sustainable, reliable, cost-effective energy supply for the next three decades. The IRP focuses on four core areas: demand, generation, transmission and distribution. However, one of the major obstacles identified in the IRP is the need for substantial funding, with an estimated US$14 billion required for its full implementation. Given that most energy projects are not short-term, these projects must commence as soon as possible if Zambia is to meet the expected increase in demand needed to reach the three million tonne copper production target by 2031.

Getting the best energy mix will be critical to managing future energy disruption and ensuring the country remains on course to meet its copper production targets.

[14] Ministry of Energy.

3.2 Investment update

Zambia has seen a significant increase in pledged and actualised investments since the start of 2022. In May 2022, First Quantum Minerals announced additional investment in Zambia of US$1.3 billion via their Kansanshi S3 project and Enterprise Nickel Mine. Since then, there have been several notable mining investment projects announced. The nature and scale of the projects signal a much-improved outlook for the sector. Stakeholders can be confident that Zambia's mining fortunes will improve if the projects are successfully implemented.

The investments include exploration ventures, expanding existing projects and resolving issues affecting problematic mining assets.

Below is a list of notable projects that have been announced in the recent past:

Table 4: Notable projects investment estimates

Company name	Investment details	Investment estimates (US$)
First Quantum	Kansanshi S3 expansion and the Enterprise Nickel project. Both projects are located in North-Western Province. Once completed, the S3 expansion project is expected to increase to approximately 250,000 tonnes per annum (2022 production was 146,282 tonnes).[15]	US$1.25 billion - S3 Expansion project US$100 million - Nickel Project
Moxico Resources	Located in rural North-Western Province, Mimbula Copper Project is poised to leverage the anticipated increase in[16] demand for copper due to the global shift to renewable energy.	US$180 million cumulative
Lumwana Copper Mining	The company is investing in an expansion project that is expected to increase Lumwana's annual production to an estimated 240,000 tonnes of copper from a 50 million tonne per annum process plant over a 36-year life of mine.[17]	US$2 billion
KoBold Metals	Exploration is still underway, with the intent for production to begin by 2030. Kobold Metals indicated it holds plans to fast track development of the new mine at its Mingomba deposit, which would cost about US$ 2 billion. According to KoBold, the Mingomba deposit that is still under exploration has copper ores grade of about 5% which could indicate the highest grade among Zambian discoveries in 100 years. The Ore grade of 5% deposit quality will place Mingomba alongside Ivanhole's Kamoa Kakula Copper mine in the DRC.[18]	US$150 million
China's Nonferrous Mining Metal Mining (CNMC)	This will be distributed as follows: Chambishi Copper Mine US$450 million; Luanshya copper mine US$600 million; and Sino Metals and warehouse project US$200 million.	US$1.3 billion by the end of 2025.
Arc Minerals	Joint exploration project with Anglo American Exploration.	US$90 million

[15] https://www.miningweekly.com/article/fqms-kansanshi-s3-mine-expansion-back-on-track-2023-10-19

[16] https://www.businesslive.co.za/bd/world/africa/2022-04-06-britains-moxico-resources-plans-100m-expansion-of-copper-mine-in-zambia/

[17] https://www.barrick.com/English/news/news-details/2024/lumwana-super-pit-expansion-officially-launched/default.aspx

[18] https://trendsnafrica.com/kobold-metals-to-invest-us-150-million-in-zambia-anticipates-production-of-copper-and-cobalt-within-a-decade/

[19] https://economictimes.indiatimes.com/markets/stocks/news/update-2-vedanta-weighs-minority-stake-sale-in-zambian-copper-assets-to-reboot-mines/articleshow/107498921.cms

Company name	Investment details	Investment estimates (US$)
Mopani Copper Mines	In 2024, International Resource Holdings (IRH) completed the acquisition of 51% stake in Mopani Copper Mines for US$1.1 billion. IRH's current output is around 60,000 tonnes and with the new capital injection, plans are underway to ramp up production to 225,000 tonnes per annum. As of August 2024, IRH had produced 200 tonnes of copper following its revival.	US$1.1 billion
Konkola Copper Mine	Konkola Copper Mines officially handed over to Vendata Resources in August 2024. The company paid off over US$246 million to its creditors to settle the long outstanding debt. Once back online, Konkola is expected to produce over 300,000 tonnes of copper per annum.[19]	US$1.25 billion

3.3 Exploration update

Mining exploration is searching for mineral resources beneath the earth's surface to assess their potential for economic extraction. This involves a series of methods, including geological surveys, sampling of soil and rock, and drilling to gather data on the size and quality of mineral deposits. The primary goal is to identify viable sites for future mining operations, ensuring that resources can be extracted efficiently and sustainably. By evaluating the geological and economic aspects, mining exploration helps determine whether a site is worth developing into a full-scale mining project.

Geological surveys and licensing

- In an unprecedented move, the Ministry of Finance has allocated K198 million in the 2024 national budget for a high-resolution countrywide geological survey. This survey will initially cover the Southern, North-Western, Western, and Central provinces, with plans to extend to the entire country over the next two years. This significant investment, the largest in recent history for geological surveys, aims to enhance the understanding of Zambia's mineral resources.

- Geological mapping, exploration surveys and exploration licenses. To build upon the current geological knowledge, the Ministry of Mines and Mineral Development has undertaken geological mapping for selected areas of the country.[20] This effort has increased the national geological coverage from 55.6% to 56.4%. The mapping and exploration surveys are crucial for identifying new mineral deposits and providing valuable data for future mining projects.

- Geochemical sampling has been conducted in areas such as Zimba and Mkushi, involving the collection of 1,400 samples. These samples target minerals such as lithium, tin, and graphite, with the results still undergoing analysis. This sampling is essential for identifying potential mining sites and understanding the mineral composition of these regions.

- Monitoring exploration license holders, including inspections. To ensure that various exploration license holders adhere to their exploration plans, the Ministry of Mines and Mineral Development conducted inspections involving 400 companies. These inspections are vital for maintaining the integrity of the exploration process and ensuring that license holders comply with regulatory requirements. The ministry aims to foster a transparent and accountable exploration environment by conducting thorough inspections, ultimately contributing to the sustainable development of Zambia's mineral resources.

2024 Budget Address

[20] Ministry of Mines and Mineral Development.

Part 2 of

"A First-Hand Perspective on Exploration"

by Mfikeyi Makayi, CEO KoBold Metals Africa

Kurt's closing message in the 2023 PwC Zambia Mining Report

KoBold's mission is to make exploration more efficient and effective, and we're investing heavily in research and development to achieve that mission. We're developing new sensors for measuring novel properties and phenomena to complement our AI software. Indeed, KoBold has the largest exploration research and development budget of any mining company.

Overall, exploration is a costly and high-risk venture that requires patient capital and the

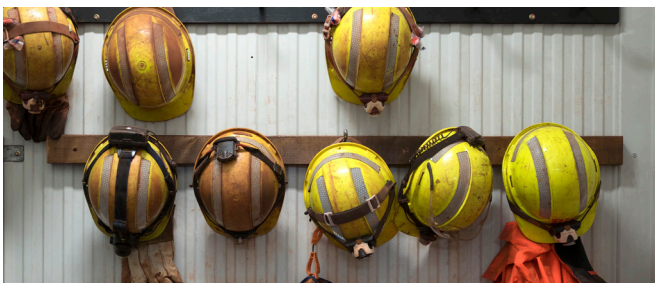
benefit of today's technological advances if it is to deliver more quickly. It must be supported by the right policies that ensure that the right people own licenses and that focused incentives are given to those ready to invest in much-needed ventures.

Last year, my colleague, Dr Kurt House, laid the foundation for why exploration needs more research and development and increased technology innovations to improve the rate and cost of discovering new mineral deposits. Even with such innovations, a sound and stable policy framework is essential to enable domestic capital formation and attract foreign direct investment in exploration and development projects.

Zambia, endowed with natural and mineral resources, undoubtedly attracts capital, but capital is fleeting. Long-term access to capital markets correlates with perceived jurisdictional risks. An unpredictable and unstable policy environment means executives must, on the one hand, build projects while managing versatile, even volatile, relationships on the other.

Mineral exploration is a sequence of activities based on hypotheses of mineral prospects and testing those hypotheses to "prove them right or wrong". The sequence of activities varies based on scientific knowledge and principles of the earth beneath our feet. These activities involve subsets of the more expansive geoscience branches such as geophysics, geochemistry, paleontology, mineralogy and petrology. To further understand the mineral prospects, these disciplines require deploying various study techniques and surveys to collect geoscientific data supporting multiple hypotheses or falsifying them. With the advancements in artificial intelligence, machine learning and high-tech computing power, exploration activities have been propelled to new heights.

Every existing mining operation began as a geologic hypothesis—but most geologic hypotheses don't become operating mines. The objective of exploration is to collect the incremental information that is most likely to falsify the original hypothesis. Fortunately for Zambia, decades of work exist from pre-colonial times on how mineral-bearing rocks formed millions of years ago on the Copperbelt. Unfortunately for Zambia, this has blurred the importance of conducting meaningful exploration with the latest technology to turn prospects into producing mines. Comfortable and familiar with mining, exploration investment had lagged. This has taken us back to the drawing board, a regenesis of sorts, to the need for an exploration industry focus.



Exploration at Mingomba

Historical exploration drilling in the Mingomba area of Chililabombwe District dates back to the pre-1950s, to what was then known as Konkola North, and various parties have drilled the area up to 2022. Since KoBold's entry in 2022, and with ZCCM-IH, we have drilled 67,000 metres to depths of over 2km, characterising and unlocking the value of a consistent continuous high-grade (greater than 5%) ore body. Mingomba is becoming one of the world's most exciting copper projects more than 70 years later. The deposit sits between two large mines and is located within the heart of the century-old Copperbelt mining district.

To conduct this work at this rate, an agile operation that began with 15 employees now has over 300 employees, including contractors. More than US$250million has been invested in the asset in just 18 months. A team of explorers, including geoscientists, geotechnicians, data scientists, engineers and drillers, combine to form the heart of exploration work, supported by a field operations team and shared services in health, safety, environment, community engagement, IT, HR, finance and administration.

In exploration, as with any scientific work, ideas need to be proven and, at KoBold Metals, fostering a culture of being a Bayesian explorer means hypotheses are repeatedly tested or falsified, i.e. "proven right or wrong" based on conditional probabilistic principles coupled with scientific computing prowess. In developing and testing our multiple hypotheses at Mingomba, data science has enabled us to maximise the probability of intersecting areas of significant copper grade and thickness. In 2024, Mingomba continued drilling to fully characterise the orebody morphology, composition and competency to guide mine optimisation.

A typical drilling exploration site has three fundamental work areas: the drilling site where drilling operations occur; the core processing repository where geologists receive, process, sample, dispatch and store the drill core; and administrative facilities. In remote areas, an accommodation facility is required for continuous operations. The Mingomba exploration campus is a state-of-the-art facility that includes the above and deploys the company's world-class technology abilities within the processing and study of drill core, a key element of testing hypotheses through actual technical programmes to analyse findings.

Next steps: mine development

Mingomba is an exciting deposit and the work to guide mine optimisation has commenced. Industry standards are guided by terms like preliminary economic assessments, prefeasibility and feasibility studies that inform the full project requirements. For Mingomba, this includes scientific and engineering studies that cover technical engineering and mine design (building a shaft complex, process plants, surface and underground infrastructure, and meeting all environmental and regulatory requirements). Successful mine optimisation will be followed by construction, commissioning and then production. The level of acceleration to become production-ready by 2031 – 2032 requires optimisation of the engineering processes, transparent and effective stakeholder collaboration, and policy stability for large-scale investment and operation to be realised so that the project can produce copper for many decades to come. The eco-system of a project built of this magnitude will generate significant economic activity through direct and indirect employment, increased trade activity, and development of support services.[21]

Wider exploration projects

KoBold Metals, in partnership with Tertiary Minerals Zambia, is conducting exploration drilling on the Konkola West License, southwest of the Mingomba tenure and west of KCM's tenure. Drilling commenced in April 2024. Most recently, KoBold Metals teamed up with Midnight Sun to explore the Dumbwa area of Solwezi, North-Western province. Globally, KoBold Metals has 60 exploration projects in 14 countries, focused on copper, cobalt, nickel and lithium.

Mineral exploration work is the foundation of the mining industry. It is necessary and requires patience. It can move rapidly if all stakeholders play their part.

[21] https://www.pdu.gov.zm/blog/mingomba-mine-project-takes-shape

Table 5: Mingomba Fact Box

Mingomba fact box	
Metres drilled	64,300 metres of diamond drilling since November 2022
Team employed, including business partners	Over 300
Corporate social investments committed	1. Kawama Combined School 2. Mwabu Education Programme 3. UNZA/CBU/Stanford scholarship partnership 4. 5 health facilities in direct area of impact - provision of medical equipment (Project Cure) 5. Sustainable farming programme for 60 farmers
Partnerships	Archive digitisation projects with ZCCM-IH & Geological Survey Department
Time to production planned	Eight years
Expected initial production	300kTPA

Source: KoBold Mining

3.4 Regulatory and policy developments

Shortly after their election in 2021, the United Party for National Development government announced its intentions to achieve several goals regarding managing the country's mineral resources and mining sector. These included:

1. Diversifying the economy away from copper mining as the mainstay of the mining sector and the broader economy.

2. Promoting a competitive, stable and predictable policy environment.

3. Enhancing the monitoring mechanisms to determine the volume and content of minerals extracted.

4. Increasing local ownership in the sector.

5. Enhancing local participation in the mining value chain.

To further these ambitions, the Government developed and published several policy documents. Not all are effective as yet. Notable were:

1. The Minerals Regulation Commission Bill 2024;

2. The Draft Local Content Regulations;

3. The Critical Minerals Strategy;

3.4.1 The Minerals Regulation Commission Bill

Notably, the Zambian Cabinet announced its approval for publishing and introducing the Minerals Regulation Commission Bill, 2024 in Parliament.[22]

The objectives of this bill are to:

1. Regulate and monitor the development and management of the minerals in the Republic of Zambia.

2. Establish the Mineral Regulation Commission and provide for its functions.

3. Establish the Mining Appeals Tribunal.

4. Repeal and replace the Mines and Minerals Development Act, 2015.

5. Provide for matters connected with or incidental to the preceding.

Notable is that, if enacted, Zambia would have a dedicated mining sector regulator - something that has been absent. If well-designed and implemented, the Commission could be the foundation for long-term policy stability. This is because, if run professionally and independently, the entity would be the channel through which policy is developed, tested, implemented and monitored.

Additionally, there has been concern about the level of non-compliance by some players in the sector. Better oversight can ensure that the occurrence of non-compliance is reduced significantly.

Our long-held view is that the lack of a well-established regulator is part of why the country has, over the years, seen many changes to various policy positions impacting the sector.

There is some concern about whether a regulator may be overreaching in its operations. There is a need for extensive consultation, careful mandate design, staffing with the right caliber of individuals, transparency in operations and consistent application of the set mandate. Ultimately, it must inspire even greater confidence in the sector.

[22] https://www.parliament.gov.zm/sites/default/files/documents/bills/THE%20MINERALS%20REGULATION%20COMMISSION%20BILL%2C%202024.pdf

3.4.2. The National Critical Minerals Strategy

Currently, all minerals are classified as critical for the sector. The Ministry of Mines and Mineral Development has issued the National Critical Mineral Strategy 2024 to 2028.[23] This strategy aims to guide the effective exploitation of the country's mineral resources to foster socio-economic development. The transition to renewable energy and technological advancements has created new opportunities for the sector, particularly for minerals beyond the traditional copper, such as lithium, nickel, cobalt and manganese.

The policy has the following aims:

1. Advancing geological mapping and mineral resource development and management

2. Enhance strategic government and private sector partnerships

3. Beneficiation and value addition

4. Research and development

With the global shift towards electric vehicles, the demand for minerals that are core components in batteries, such as lithium, nickel and cobalt, is expected to rise significantly. According to the World Bank Group, the production of minerals like graphite, lithium and cobalt could increase by nearly 500% by 2050 to meet the growing demand for energy technologies. It is estimated that over three billion tonnes of minerals and metals will be needed to deploy wind, solar and geothermal power and energy storage required for achieving a below two °C future.

The International Energy Agency has projected that meeting the target of net zero globally by 2050 will require six times more mineral inputs in 2040 than today. This underscores the critical importance of these minerals in the transition to renewable energy and the need for strategic planning and investment to ensure their sustainable supply. The National Critical Mineral Strategy is crucial in positioning Zambia to capitalise on these opportunities and contribute to global efforts to combat climate change.

Some proposals under the third pillar of enhancing strategic Government and private sector partnerships appear controversial, however. Notable examples include:

1. Establish a Government special purpose vehicle as an investment arm in the critical minerals sub-sector.

2. Develop a production sharing mechanism of a minimum of 30% for government's special purpose vehicle in the critical minerals sub-sector.

3. Establish an investment framework of a minimum of 30% of government's special purpose vehicle in all greenfield projects in the critical minerals sub-sector.

4. Establish regional and national value chains in critical minerals exploitation.

5. Formulate a local content threshold of at least 35% of the annual procurement for the critical minerals' sub-sector.

There is currently little information regarding how exactly the Government will implement the above strategies. It is clear that greater participation is desired, but at what cost? Clarity regarding how the above intentions will be achieved is crucial. For example, will production and investment in assets be at fair value?

The absence of clarity will result in greater uncertainty, which is not ideal for spurring investment in the sector.

[23] National Critical Minerals Strategy 2024 - 2028

3.4.3 The draft Local Content Regulations

The Zambian Government has been working on implementing the Local Content Regulations for the mining sector to increase the participation of Zambian businesses and individuals in the country's mining industry. These regulations are part of broader efforts to promote local economic development and ensure that Zambian citizens and companies benefit more directly from the mining sector.

The key features of the draft Local Content Regulations include:

1. **Local procurement:** mining companies are required to prioritise sourcing goods and services from Zambian-owned businesses. This includes everything from equipment to specialised services, with an emphasis on developing local suppliers in the value chain.

2. **Employment of Zambians:** the regulations mandate that mining companies should give preference to Zambian citizens in employment. The focus is also on training and upskilling local workers.

3. **Capacity building:** mining firms are encouraged to invest in the development of local suppliers and employees through training, technology transfer and partnerships. The aim is to boost the capabilities of Zambian enterprises so that they can meet industry standards and compete effectively.

4. **Monitoring and compliance:** there will be mechanisms to monitor compliance with the local content provisions, and mining companies will need to report on their local procurement, employment and capacity-building efforts.

5. **Strategic sectors:** the regulations identify key sectors where local content should be maximised, such as mining inputs, transportation, logistics and catering, among others.

6. **Stakeholder involvement:** the Government aims to collaborate with the private sector, local communities and other stakeholders to ensure the regulations benefit a broad range of Zambians while also maintaining a competitive mining sector.

The local content strategy is expected to enhance local industry participation, create jobs and stimulate other sectors of the economy.

3.4.4. Overall assessment of the regulatory environment

In order to continue to attract investment into the sector, policy stability is critical. The number of new policies period in a short period may actually signal the opposite. It may be more prudent to stagger the changers over a period with the timetable shared with all stakeholders. Adequate consultation should also be undertaken with all stakeholders so that there is buy-in.

3.5 Artisanal and small-scale miners

The Ministry of Mines and Mineral Development has issued 28 licenses to cooperatives. Additionally, the ministry is constructing market centres for gold trading in the Rufunsa and Mumbwa districts. These projects are expected to be completed by the end of the third quarter 2024.

The ministry has been formalising the artisanal and small-scale mining sector to enable people to make meaningful economic contributions. As part of this initiative, the ministry has licensed 126 gold mining cooperatives and 65 cooperatives involved in other minerals besides gold. Sites for constructing gold marketing centres have been identified in seven districts: Mumbwa, Rufunsa, Lusangazi, Vubwi, Petauke, Chisamba and Chibombo.

Several mines are expected to come on board with Kitumba mine in Mumbwa district, which is scheduled to commence production within the next three years. A technical committee on manganese has been created to enhance oversight over small-scale mining activities.

Kagem is recognised as one of the key producers of gemstones in Zambia, yet it only accounts for 20% of the nation's total gemstone production. This highlights the importance of formalising and supporting this subsection of the mining sector. The Government will foster sustainable growth and development within the gemstone industry by providing the necessary regulatory framework and support. This initiative is essential for maximising the economic benefits of gemstone mining and ensuring that the sector contributes meaningfully to the country's overall economic prosperity.

The Ministry of Mines and Mineral Development has made significant strides in formalising the artisanal and small-scale mining sector. The anticipated start of operations at new mines, such as the Kitumba mine, and the establishment of a technical committee on manganese further underscore the Government's commitment to enhancing oversight and fostering sustainable growth in the mining sector.

The substantial increase in the 2024 budget allocation for the sector from K50 million to K131 million reflects the Government's dedication to developing the mining industry. This approach is intended to have a trickle-down effect on Zambia’s overall economic prosperity. The Ministry of Mines and Mineral Development has made significant announcements that relate to formalising the artisanal and small-scale mining sector. With the anticipated start of operations at the new Kitumba mine, the ministry’s establishment of a technical committee on manganese is expected to enhance oversight and foster sustainable growth in the mining sector.

4. The journey to three million tonnes of copper

Attaining the Government's three million tonne copper production target by 2031 remains an ambitious target for the sector. There are several factors that need to be considered and addressed to achieve this target. In July 2024, the Government launched the National Three (3) Million Tonnes Copper Production Strategy by 2031. This strategy aims to accelerate and maximise the benefits of exploiting copper production, with a focus on the following:

i. Creating an enabling environment for copper production expansion.

ii. Monitoring greenfield projects.

iii. Exploiting mineralised tailings.

iv. Supporting artisanal and small-scale mining.

v. Conducting high-resolution aerial geophysical surveys.

vi. Promoting investment.

vii. Building capacity for research and development.

According to the US Geological Survey Mineral Commodity Summaries for 2024, Zambia's estimated reserves are 21 million tonnes of copper. The country is ranked 10th overall globally. Increasing the country's found copper reserves is imperative if significantly higher production is to be achieved.

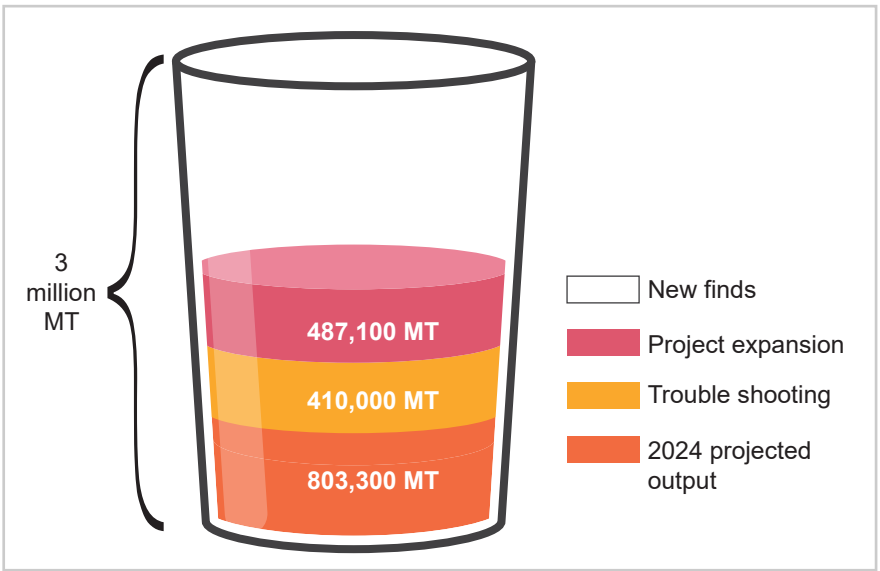
Table 6: Rank of estimated Copper reserves by Country

Rank	Description	Estimated reserves '000
1	Chile	190,000
2	Peru	120,000
3	DRC	80,000
4	Russia	80,000
5	Mexico	53,000
6	United States	50,000
7	China	41,000
8	Poland	34,000
9	Indonesia	24,000
10	Zambia	21,000
11	Kazakhstan	20,000
12	Canada	7,600
13	Australia	6,100
	Other countries	180,000
	World total (rounded)	1,000,000

Source: US Geological Mineral Commodity Summaries

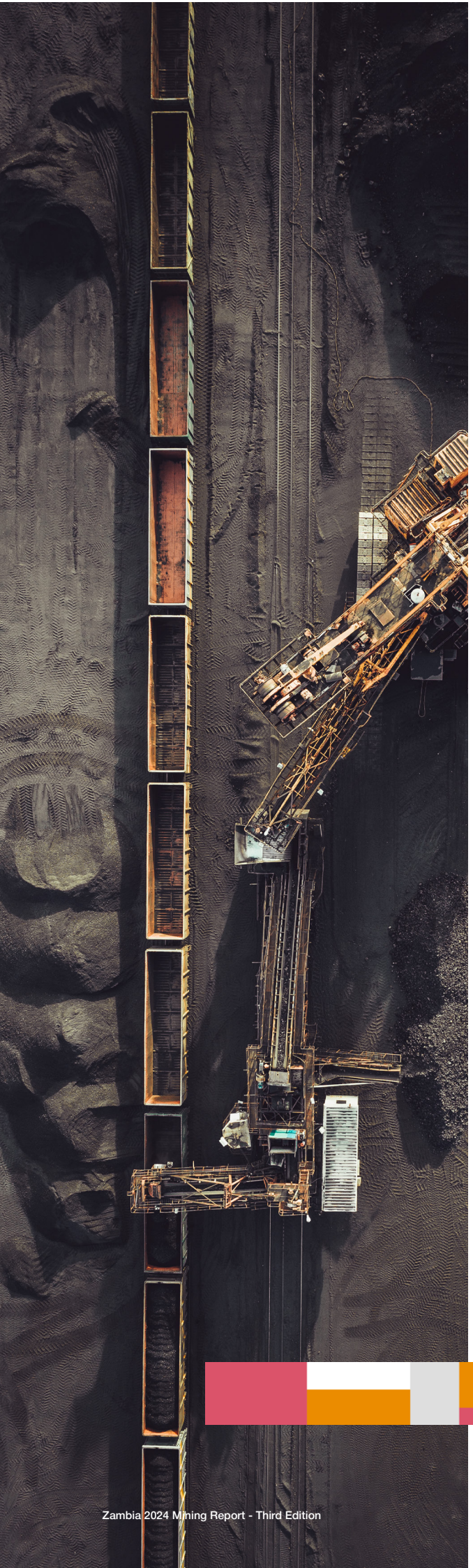
To assess the probability of achieving the target, we analysed the current projected output for 2024 and the expected upside from different investments.

Figure 17: A closer look at the 3m MT copper target



Source: PwC Analysis

US Geological Mineral Commodity Summaries



Our current best-case estimate is a maximum capacity of 1.7 million tonnes, assuming all estimated capacity comes online immediately. This is unrealistic but gives a sense of our assessment of the maximum possible production capacity given current conditions.

1. **2024 projected output:** the Ministry of Mines and Mineral Development projects that Zambia will produce 803,300 tonnes of copper in 2024. In 2023, 698,000 tonnes of copper was produced, while 763,550 tonnes were produced in 2022.

2. **Troubleshooting:** This relates to the maximum projected additional output targets announced for troubled existing assets. This includes the likes of Mopani Copper Mines and Konkola Copper Mines.

3. **Project expansions:** this is the additional production contribution expected from mining assets that have announced significant expansion projects to increase or sustain production. Examples include First Quantum Minerals' investment into the Kansanshi S3 project and the expansion by Barrick Lumwana.

4. **New finds:** these represent new discoveries that must be made to bridge the remaining gap.

It is important to note that:

1. The investments require time before the production output will be realised.

2. Existing production capacity may decline as assets get closer to the end of their mine lives. Consequently, the level of new resource finds will need to be higher than the three million tonnes annual target if this figure is to be sustainable and take into account diminishing resources at older mines.

3. Ramping up production will result in a significant increase in energy requirements. Zambia is currently dealing with a severe energy deficit so developing and implementing a long-term solution to meet the growing energy demand is imperative if the production increase goal is to be achieved.

Our overall assessment is that given how much time it takes to benefit from mining investment, achieving three million metric tonnes by 2031 appears ambitious. However, although its achievement is questionable at this stage, there are signs that Zambia will increase its production significantly in the coming years.

Refer to appendix 1 for the details on the 3 million MT copper output target.

5.Environmental, social and governance

The environmental, social and governance (ESG) agenda has made progress in the last decade.

Mining companies need to ensure that they incorporate ESG principles into their production processes, including value chains and final products. The mining sector has a more significant role in driving sustainable development and transition to renewable energy by providing materials for infrastructure development and consumer demand.

Sustainability reporting has continued to be a hot topic globally, driven by the International Sustainability Standards Board (ISSB). In June 2024, the board issued its inaugural standards, IFRS S1 and S2, with more expected to be released shortly. In Zambia, the Zambia Institute of Chartered Accountants mandated adopting these two disclosure standards for publicly accountable entities (listed entities) effective for annual reporting periods beginning on or after 1 January 2025.

Sustainability reporting is gaining prominence in Zambia due to escalating sustainability/ESG risks. The country is grappling with severe climate events, such as drought and temperature variations, which are increasingly frequent and prolonged and present many challenges to various sectors. Key regulatory drivers for sustainability/ESG disclosures include the Environmental Management Act. 12 of 2011, Employment Code (Act No. 3 of 2019), Mines and Minerals Development Act, Companies Act (No. 10 of 2017), Section 84 (1) of the Securities Act (No. 41 of 2016) and green loans guidelines, among others. The currently available sustainability reporting baselines that the mining companies can use are:

- ISSB Sustainability Disclosure Standards
- Global Reporting Initiative standards
- Sustainable Development Goals
- 8th National Development Plan
- Nationally Determined Contributions Implementation Framework
- National Green Growth Strategy
- National Adaptation Plan

These baselines provide organisations with a foundation for consistent, comparable and credible sustainability/ESG reporting, aligning with national and international sustainability objectives.

Sustainability reporting is an essential strategic tool for organisations in Zambia, enabling them to navigate the complexities of modern sustainability challenges and build long-term value and resilience.

6. Conclusion

Commodity prices have risen strongly in the last four years and are expected to stay strong for some time. If Zambia is to exploit these high prices and reach its three million tonnes of copper per annum target, it is essential that the Government maintains a nurturing policy environment that allows existing and new mining projects to flourish. Stakeholders that we spoke to for this report said that, in particular, stable tax legislation, a strong macroeconomic environment and continued political stability were vital for stimulating investment in mining. An available and reliable energy supply is also critical if the sector is to meet its ambitious production target.

Given the lengthy exploration and construction phases in mining, the Government could look at creating policies that encourage AI skills development and favourable pricing of AI technology. For example, providing tax incentives on technology used in exploration, with Kobold being a point of reference. Kobold has shown that AI can significantly accelerate the time to commercial production so that a company can start producing copper and cobalt within 10 years compared to the average 14 years from exploration to full production. Implementing similar AI-driven strategies could boost investments in the mining sector and help achieve the target of three million tonnes of copper production by 2031.

Finally, the focus on transition energy continues to provide more opportunities to the mining sector.

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Notes

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[2] Ministry of Mines and Minerals Annual Report 2023.

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[4] file:///C:/Users/emonga003/Downloads/2024%20Mid%20Year%20Economic%20Review%20(3).pdf

[5] Zambia Revenue Authority 2023 Annual Report.

[6] ZCCM-IH 2023 Annual Report.

Appendix 1 - 3 Million MT Copper Output Target by 2031

Name of company	2024 projected production (MT)	Trouble shooting (MT)	Expectded additional production from new investments (MT)	Total at full capacity (MT)	Mineral
Lumwana Mine	150,000	-	140,000	290,000	Copper
Kalumibila Mine	265,000	-	-	265,000	Copper
Kansanshi Mine	138,000	-	112,000	250,000	Copper
Lubambe Mine	20,000	-	18,000	38,000	Copper
Chibuluma Mine	3,500	-	500	4,000	Copper
Mopani Copper Mine	60,000	140,000	-	200,000	Copper
NFCA Chambishi mine	70,100	-	25,100	95,200	Copper
Sino Kasempa	450	-	1,250	1,700	Copper
Luanshya Copper Mines	43,700	-	31,800	75,500	Copper
KCM	30,000	270,000	-	300,000	Copper
Kasisi Copper Mine	550	-	1,450	2,000	Copper
Sino Metals	12,000	-	-	12,000	Copper
Macrolink	-	-	12,000	12,000	Copper
Mimbula Minerals (Moxico)	10,000	-	40,000	50,000	Copper
Mwembeshi Resources	-	-	50,000	50,000	Copper
Kashime Copper	-	-	15,000	15,000	Copper
Kitumba	-	-	25,000	25,000	Copper
Changfa Resources Limited	-	-	15,000	15,000	Copper
Total	**803,300**	**410,000**	**487,100**	**1,700,400**	
Targeted production by 2031 (MT)				3,000,000	Copper
Deficit- New finds (MT)				(1,299,600)	Copper

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