



ZAMBIA COPPER WIRE AND CABLE MARKET ASSESSMENT

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This study was prepared in response to a request from the EU Delegation Zambia and COMESA.

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FOREWORD

Karolina Stasiak, Ambassador of the European Union to Zambia and COMESA.

DEAR READERS,



It is my pleasure to introduce the **Zambia Copper Wire and Cable Market Assessment** report, commissioned by the European Union and developed by Africa Rise. The objective of this report is to help the European Union, the EU Member States as well as Development Partners to better understand how to strengthen collaboration and explore opportunities along the copper value chain to achieve sustainable development.

The EU sets green partnerships for sustainable and resilient economic growth and job creation as a key objective for its cooperation with Zambia. The Zambia Copper Wire and Cable Market Assessment Report comes at a time when the global demand for critical raw materials is increasing, driven by decarbonisation of economies. The EU has adopted the Critical Raw Materials Act, a comprehensive response to the challenge of securing necessary materials enabling Europe to meet its 2030 climate and digital objectives. The Act promotes strategic partnerships with producer countries in order to build strong, resilient, and sustainable value chains for critical raw materials globally. In October 2023 the EU and Zambia, the 7th largest world copper producer, agreed on a strategic partnership for sustainable material value chains.

Zambian copper industry has a great potential to expand value-addition to downstream copper value chains. New partnerships can drive sustainable growth, promote circular economy and inclusive development. With demand for critical raw materials expected to grow exponentially, from exploration and extraction to value addition and recycling, the European Union stands ready to support Zambia's ambition to develop a thriving mining industry that is environmentally and socially responsible and brings benefit to local communities.

Zambia has announced plans to increase copper production from 760 thousand metric tonnes to 3 million metric tonnes by 2030. The Copper Wire report identifies at least nine concrete business opportunities in upstream and downstream sectors and circular economy related to the copper value chain. It set the stage for discussions during the EU-Zambia Business Forum on Growing the Copper Industry in Zambia through Green Value Chains that brought more than 200 enterprises and representatives of business associations, investors and government from Zambia and Europe to Kitwe on 12-14 April 2024.

It is my hope that this report will **inspire European and Zambian entrepreneurs and joint ventures and contribute to making the mining sector a real transformative driver of Zambia's economy, and to moving towards a green resilient economy that works for people and is good for our planet.**

EXECUTIVE SUMMARY

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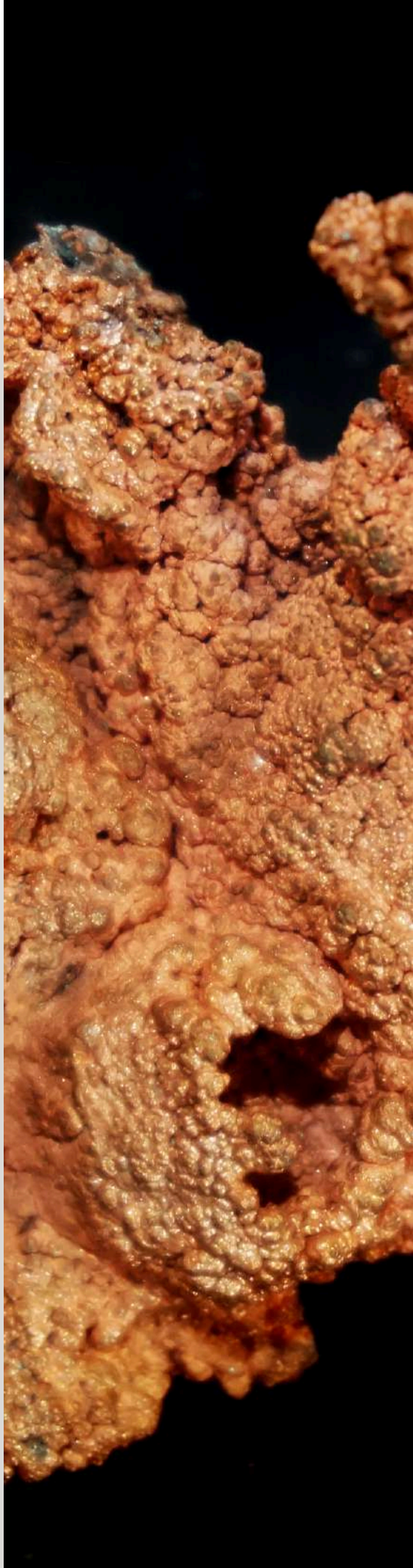
ambia's economy has historically heavily relied on copper mining, which provides 70% of export revenues.

The Government of the Republic of Zambia (GRZ) has set the strategic target to increase its annual copper production from 760,000 tonnes in 2022 to 3 million tonnes by 2030, accounting for 4% of global production. The GRZ has set aside ZMW4.25bn (\$223m) to implement this plan, which includes expanding existing mines, opening new mines, and reprocessing material from over a century of mining.

The Ministry of Mines and Mineral Development (MMMD) anticipates that existing copper mines will increase production by over 2 million tonnes collectively over the next seven years, and 17 new mines will open by 2026, all quadrupling their production within four years. Adding 2+ million tonnes of new mine production capacity would require capital investments of \$40 to \$50 billion, along with exploration to delineate new deposits. In addition, tripling national copper output by 2030 is also contingent on a massive scale up of reliable, cost-competitive power generation.

Key findings from the copper market assessment study commissioned by the EU Delegation to Zambia and COMESA and implemented with the support of Africa RISE are as follows:

- Zambia has strong potential for large-scale wind and solar, but would require significant investment to scale up renewable energy generation to meet demand.
- In 2022, only 350,000 Mt cathode was produced, with the remaining 400,000+ Mt exported as lower quality blister and anode copper.
- Downstream copper fabrication faces constraints such as unreliable electricity, cost-reflective pricing policies, and infrastructure shortcomings.
- Zambia's copper industry has struggled to expand value-addition to downstream copper activities, with the two main fabricators, Metal Fabricators of Zambia (ZAMEFA) and Neelkanth Cables, purchasing only 15,000 Mt of copper cathode for domestic use and export to regional markets. These companies rely on government tenders and operate at 50% or less of design capacity.
- South Africa, with its small but competitive copper cluster, has been the primary export market for Zambia's copper rod, wire, and cable manufacturers.
- The Lobito rail corridor project may address some of Zambia's transportation infrastructure issues, offering an opportunity for Zambia to ramp up its production of copper wire and other value-added copper products.
- There are a number of investment opportunities in downstream and up stream copper, e.g. investing in new wire and cable products ; increasing the percentage of copper refined to the cathode stage; production of rod, bars, or tubes from the copper cathode at the refinery site; upgrading copper cathodes into billets and cakes; investing in the circularity of copper by reprocessing annually 1.5 to 2 million Mt of new slag, building a new anodes slimes refinery, or re-processing copper tailings to produce copper cathode for downstream manufacturing and sale into regional/global markets.



1. INTRODUCTION

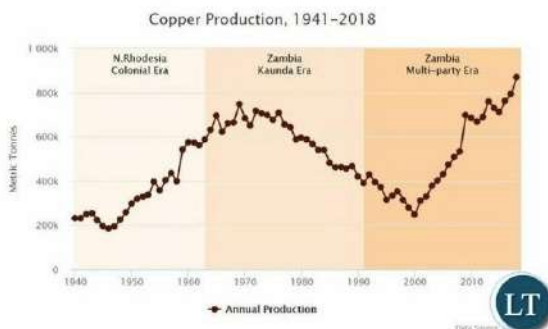


Zambia's mining sector is the foundation of the country's economy. For nearly 100 years, almost all of the copper produced each year in Zambia has been exported to manufacturers in Europe, Asia and North America.

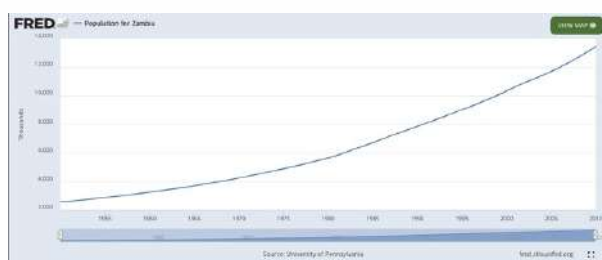
Zambia is the second largest copper producer on the African continent and the 9th largest in the world. The mining sector is crucial for foreign exchange earnings and job creation, with copper and cobalt accounting for over 70% of Zambia's export earnings and nearly 40% of government revenues. However, the sector has only contributed a modest 1.18 percent of real GDP growth from 2017 to 2021. In addition, the sector is highly susceptible to global shocks, leading to attempts at economic diversification in recent years.

Zambia's copper mines are primarily concentrated in the Copperbelt Province, but over the last 20 years, mining activities have expanded to the North-Western Province. Value addition is limited in Zambia, and the country faces challenges in human development, employment, poverty, and increasing inequity. The country's population has grown rapidly, creating pressure for the government to generate income from fixed mining activities to meet the growing demand for social services and amenities. Zambia's rapid population growth and high poverty levels further compound the challenges.

Figure 1 - Zambia Population Growth vs Copper Production (1970-2020)



Source : Lusaka Times in 2021 - see: <https://www.lusakatimes.com/2021/01/18/a-copper-foundation-zambia-is-a-nation-founded-on-copper/>. It shows the decline in copper production from 1970 to 2000 and the subsequent recovery to current levels that are slightly greater than the prior (1970) peak.



Source: The St. Louis Federal Reserve Bank has a nice interactive tool that allows customization of dates, graph formats - see: <https://fred.stlouisfed.org/series/POPTLZMA173NUPN>. T

The 8th National Development Plan in Zambia aims to drive economic transformation, value addition, and job creation through traditional sectors such as mining. Mineral processing was identified as a priority sector for development, and there is a clear interest in promoting value addition through industrialisation. Metal Fabricators of Zambia (ZAMEFA) has been the flag carrier for copper since the 1960s, with an estimated capacity of 36,000 Mt/year of copper rod and around 6,000 tonnes capacity for low voltage wire and cable. However, ZAMEFA's activity in copper products has been cut back in the past five years due to difficulties in accessing copper raw material.

There are currently other players that have set up in the last decade; Neelkanth Cables with a capacity of about 8000mt/y, begun operations in 2017 and claims to convert all their copper rod production into wire and cable products. Uniflex Wire & Cable, a new entrant and a subsidiary of Apar Industries, began operations in Lusaka in 2022, with a capacity of 3600mt/y is also producing only wire and cable. Both companies produce for local and regional markets, with customers ranging from households to mines, utilities, and construction manufacturers. Zalco which has been in the market even longer than Neelkanth and Uniflex, remains small and currently produces only buiding wire but at a very small scale.

KEY TIMELINES

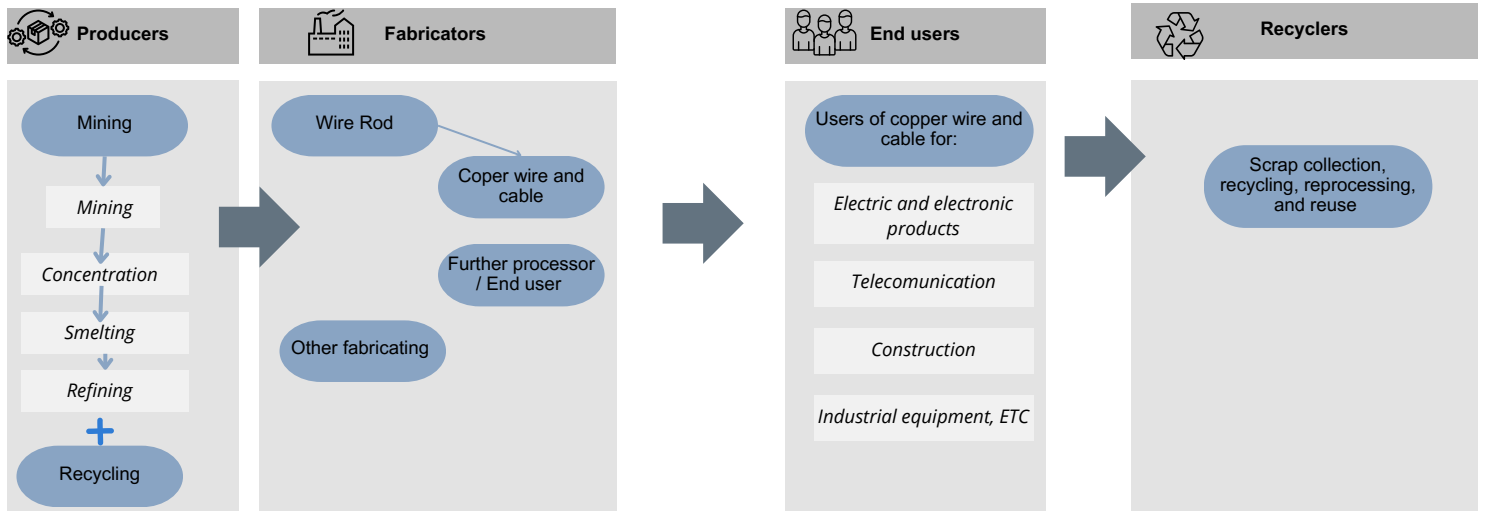
- In March 2023, the EU adopted the Critical Raw Material Act (CRMA), which emphasizes the need to supply materials essential for a fair green and digital transition also through strategic partnerships with producer countries.
- In March 2023 A market assessment study on copper cable and wire was commissioned by the EU Delegation and implemented with the support of Africa RISE. The study covers the wire and cable value chain, identifying investment opportunities and business cases for EU investors, including converting or reopening existing metal transformation plants in the country.
- In October 2023, the EU and Zambia agreed on a strategic partnership on Sustainable Raw Materials Value Chains, which first concrete action was a Business Forum in April 2024 on copper industry and green value chains. This market assessment report was presented at that Business Forum.

Copper fabrication involves the manufacture of products such as copper wire, wire rod, low-voltage cable, and other copper-based semi-manufactures. It lies between:

- The industry that produces copper, as a metal from mined ores as well as from recycling (the Supply)
- The users of copper in finished products (the Demand) such as electronic goods.

Figure 2 shows the position of the fabricating industry within the overall copper industry.

Figure 2 - Copper Industry Value Chain



Copper is obviously a major input into the copper fabrication industry, both from primary mining extraction but also from recycling. Recycling copper is an effective way of reintroducing a valuable material back into the economy. Recycling copper requires up to 85% less energy than primary production. Around the world it saves 100 million MWh of electrical energy and 40 million tonnes of CO2 annually [1]

The increased recycling of copper is being driven by the growth in use of the metal across the planet and by demand for companies pioneering technologies allowing for increased efficiency in refining secondary (low grade) scrap and in processing for direct melt high purity copper scrap. Copper is ubiquitous in the equipment and gadgetry of modern life, namely high-tech products, electrical installations, engines, solar systems and smart buildings. Since mid-1960s, global demand for refined copper has increased by over 250% (from 5 million to 20 million tons). Mine production remains vital in order to meet this growing demand. Ensuring that sufficient copper will remain available to meet society's future needs will require increased level of recovery and recycling, as well as substantial investment in mining.

There is generally a clear divide between the copper producers (those engaged in mining and/or smelting and refining copper) and the industries downstream of the production of the basic internationally traded pure copper metal form - the copper cathode. Wire rod is an exception, being made by some copper refiners, and by wire and cable manufactures, primarily for their own internal use. For refiners, it is relatively easy to add a wire rod mill adjacent to the refinery in order to capture more added value to the cathode and to benefit from economies of scale. It should also be noted that several copper producers are increasingly crossing the upstream/downstream divide and have a vertically integrated approach.



[1] <https://copperalliance.org/resource/circularity-and-recycling-in-the-eu/>

2. SUPPLY OF COPPER PRODUCTS



A

According to British Geological Survey (BGS) data, Zambia's mines produced 800,696 Mt of copper in 2021, and total copper production at the smelter stage (in the form of blister [typically grading 98–99% Cu] or anodes grading 99+% Cu) was 760,000 Mt. The leading producers in the country are First Quantum Minerals, Barrick Gold, Mopani Copper Mines (MCM) and Konkola Copper Mines (see Figure 3).

Figure 3 – General trend of the Copperbelt in Zambia and the Democratic Republic of the Congo (DRC), along with the major copper mines in Zambia's North-Western Province



Source: SANIRE, Technical Corner - Enduring the Challenge of Mining in Africa <https://www.sanire.co.za/news/587-technical-corner-enduring-the-challenge-of-mining-in-africa>

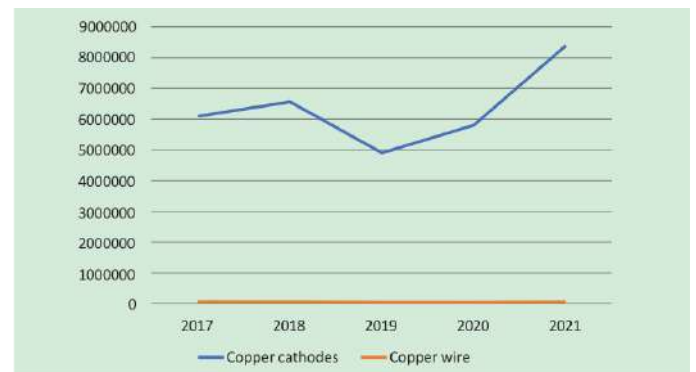
Total refined (cathode) production in 2021 was 350,000 Mt, with the balance (410,000 Mt) exported for further value-added refining.

Out of the 350,000 Mt of copper cathode produced, the copper rod, wire and cable fabricated approximated to 15,000 Mt (slightly over 4% of refined copper production). An additional 66 Mt of refined copper wire and cable products were imported in 2021 for local consumption [2].

The remaining balance of 2021 domestic copper cathode production (~ 335,000 Mt) was exported, primarily to Europe and Asia. With global copper demand continuing to exceed supply, every tonne of copper cathode produced can be sold on the global markets.

In recent years, government policy has been tailored towards the promotion of value-addition to minerals such as copper through the introduction of incentives such as a preferential corporate tax rate of 15 percent for companies that add value to copper cathodes compared to the standard 30 percent for other non-incentivised firms (as per paragraph 5(f) of the charging schedule of the income Tax Act). The illustration in Figure 4 indicates that in terms of exports, copper cathode far exceeds export of copper wire, suggesting limited value addition from the sector.

Figure 4 – General trend of the Copperbelt in Zambia and the Democratic Republic of the Congo (DRC), along with the major copper mines in Zambia's North-Western Province



Source: the global copper scrap export and import data, <https://oec.world/en/profile/hs/scrap-copper>

Stakeholder consultations revealed that Zambia's Mopani Copper Mines (MCM) management is willing to sell up to 20% of their annual production to local manufacturers, potentially supplying 20,000 to 25,000 tonnes of London Metal Exchange (LME) Grade A cathode copper in the Copperbelt area. The majority of China Nonferrous Metal Mining Corporation's Chambishi smelter cathode is exported to China for value-added manufacturing. The primary domestic wire and cable manufacturers, ZAMEFA and Neelkanth Cables, have sourced cathode from mines in the Copperbelt area. Scrap copper is not a material component of copper supply within Zambia, as smelters and downstream manufacturers collect and recycle all scrap generated.

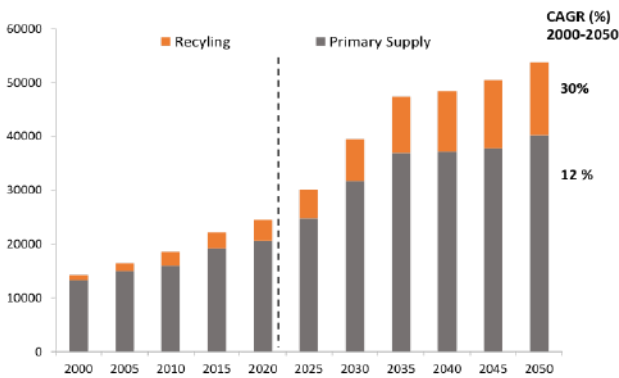
[2] based on the most-current trade data available as compiled by the World Bank

2.1. Copper Scrap Contribution to Cathode Supply

Recycling copper is a cost-effective way to reintroduce valuable materials back into the economy, requiring up to 85% less energy than primary production. However, in Zambia, recycling copper is significantly lower due to the developing nature of the economy, particularly for manufactured and consumer goods. Copper scrap is sourced from refined copper production, fabrication of new copper-containing products, or post-consumption end-of-life material recovered from scrapping old copper-containing equipment. Downstream manufacturers and copper smelters collect and reuse scrap which limits potential supplies for other uses. Zambia's consumption of copper-bearing consumer goods and industrial products also constrains the supply of end-of-life copper. This results in limited scrap supplies for small-scale domestic copper processors and fabricators, leading to higher prices and hampering the development of local SMEs. With limited scrap available, Zambia must consider where to import scrap if it chooses to increase semi-manufacturing.

Global copper demand is predicted to double in the next decade, reaching 50 million metric tons by 2035. This growth is largely due to technologies for achieving 2050 Net Zero goals. The recycling market is becoming more attractive, with an annual growth rate of 30%. The majority of copper recycling scrap comes from China, Europe, and the USA.[3]

Figure 5 - Copper Recycling Share of Total Supply



Source: WCF 2022

Source : global copper production reports, <https://oec.world/en/profile/hs/scrap-copper>

ESTIMATED SIZE OF THE LOCAL, REGIONAL & GLOBAL SCRAP COPPER MARKETS

In 2021, scrap copper was the world's 138th most traded product, with a total trade value of US\$33 billion.

As shown in Figure 6 below, in 2021, the top exporters of scrap copper were United States (US\$4.61 billion), Germany (US\$2.57 billion), Japan (US\$2.33 billion), France (US\$1.69 billion), and the United Kingdom (US\$1.67 billion).

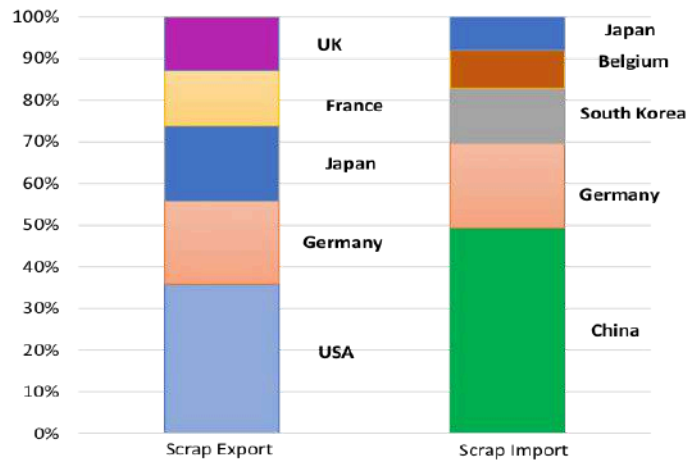
The top importers of scrap copper were China (US\$8.79B), Germany (US\$3.66 billion), South Korea (US\$2.31 billion), Belgium (US\$1.65 billion) and Japan (US\$1.43 billion).

[3] precise data of current and future copper scrap supply can only be obtained through interviews with relevant copper recycling industry players

[4] The Department of Trade, Industry and Competition of South Africa has issued a two-page notice extending restrictions on ferrous and red metal scrap exports that were introduced in November 2022. The notice from Ebrahim Patel, head minister of the department, decrees that designated forms of ferrous and nonferrous scrap "may not be exported from the Republic of South Africa for a period of six months from the date of publication of this [notice]." The notice is dated June 15, 2023, meaning it will be valid until mid-December.

[5] South Africa imports Scrap Copper primarily from: Israel (\$17.4M), Saudi Arabia (\$11.5M), United Arab Emirates (\$10.6M), Togo (\$8.37M), and Botswana (\$5.37M). The fastest growing import markets in Scrap Copper for South Africa between 2020 and 2021 were Israel (\$16.2M), United Arab Emirates (\$9.45M), and Togo (\$8.37M).

Figure 6 - Global Scrap Copper Imports and Exports



Source : global copper production reports, <https://oec.world/en/profile/hs/scrap-copper>

China and Germany are the largest importers of scrap copper, while the USA is the world's largest exporter of scrap copper.

Regionally, in 2021, Zambia exported US\$5.39 million worth of scrap copper, ranked 117th in the world, but this is understandable for the reasons mentioned above (e.g., limited local manufacturing etc.). The main destination of scrap copper exports were South Africa (US\$5.26 million), China (US\$121,000), Germany (US\$28,000), Zimbabwe (US\$65,000), and the Netherlands (US\$45,000).

In 2018, Zambia imported US\$462,000 worth of scrap copper; in 2021, scrap copper imports were reported as a total of 10 kg (from South Africa).

It is clear that Zambia is a small player in the copper scrap recycling business. However, it can grow with restrictions now in place for South Africa exports of scrap.[4] Regionally, Africa is also a small market compared with Asia, Europe and the USA. Zambia exports nearly all of its scrap copper to South Africa for further reprocessing and recycling. The significant exports of scrap copper from Zambia to South Africa may represent an investment opportunity,[5] although further research is required to fully-understand the market dynamics.

For example, are the exports driven by South Africa's capabilities to sort, smelt and refine scrap copper? Are there issues with contaminants in the scrap collected that require specific technological capabilities? The potential size of the market opportunity is approximately US\$6 million should further reprocessing and recycling of copper scrap be done in Zambia.

SOURCES OF SCRAP COPPER IN ZAMBIA AND SOUTH AFRICA

Zambia has a significant number of fragmented copper scrap collectors making it difficult to determine individual market shares without conducting extensive surveys and interviews to generate current and comprehensive data.

The following entities are reported as the primary copper scrap collectors in Zambia:

- Mopani Copper Mines (MCM): a significant copper mining, smelting and refining business, Mopani also engages in copper scrap collection. MCM has well-established scrap collection points near their mining and smelting operations, making it convenient for local communities to sell their copper scrap.
- Konkola Copper Mines (KCM): Another major Zambian copper producer, KCM operates scrap collection centres as part of their commitment to sustainability and responsible mining practices.
- TCH Zambia is the only company currently licensed by ZEMA to collect e-Waste in Zambia pursuant to the Extended Producer Responsibility (EPR) Statutory Instrument No. 65 of 2018. Regionally, most African countries do not have an overall framework for e-Waste management, and this lack of legal and regulatory frameworks in other countries could hinder companies like TCH Zambia from taking a leading role in regional e-Waste collection.
- Small-scale Entrepreneurs: In addition to the big mining companies, numerous small-scale entrepreneurs and informal collectors are active in copper scrap collection across Zambia. They often work within local communities and contribute significantly to the recycling effort.

Regionally, copper scrap collectors in South Africa are essential for sourcing raw materials for their country's smelters and refineries.

The following are the main collectors in South Africa:

- Metallix Refining: involved in the collection and recycling of various metals, including copper. They have established a network of collection centres and offer competitive prices to encourage individuals and businesses to recycle their copper scrap.
- Hulamin Recycling: focuses on the collection and recycling of non-ferrous metals, including copper, aluminium, and brass. They operate several scrap yards throughout South Africa, providing an efficient and sustainable solution for copper scrap disposal.
- A1 Waste management and recycling has a bigger share in collecting precious metals.
- Small and Medium-sized Collectors: Similar to Zambia, South Africa also has numerous small and medium-sized collectors who are actively involved in copper scrap collection. They often serve local communities and industries, contributing to the country's recycling efforts.

In both Zambia and South Africa, copper scrap collectors play a pivotal role in the recycling ecosystem.

However, the collection business in both countries is fragmented, hence data on the exact number of established collectors is limited. Interviews would need to be conducted to ascertain the market size and share of each player

2.2. Local Manufacturers (Suppliers) of Copper Rod, Wire & Cable

Zambia's copper industry is primarily focused on wire and cable, with copper rod being the only semi-fabricated copper product produced in significant volumes. ZAMEFA, Neelkanth Cables, Uniflex wire and cables and ZALCO are the main producers, with ZAMEFA producing about 10,500 Mt/year of rod, wire, and cable in 2022. Neelkanth Cables produces 4,500 to 4,800 Mt, while ZALCO – whose copper products output has been cut back in the past five years, now only produces nominal amounts from purchased rod. Uniflex Wire and Cables Ltd, a new entrant with an installed capacity of 3600mt/y, is slowly ramping up production and currently aiming to reach 50% of their installed capacity by end of 2024. The top three companies produce for local and regional markets, with the domestic power infrastructure market being a key customer sector. ZALCO expanded cable production from 2014, but faced issues with sourcing copper cathode and scrap, reducing its downstream copper manufacturing activity. Value-added copper manufacturing in Zambia remains limited, with Elswedey Electric producing electrical transformers and substations, Non-Ferrous Metals Works focusing on mining industry products, and other small copper and alloy foundries using imported scrap and alloys.



3. DEMAND FOR COPPER WIRE AND CABLE



3.1. Market Demand

The global wire and cable market is expected to grow at a 6% compounded annual growth rate, with the Asia-Pacific region dominating the market. The Asia-Pacific region is expected to dominate the copper wire and cable market. Zambia's Rural Electrification Authority aims to increase electrification to 51% by 2030, ensuring a strong baseline of specialized wire and cable products for the future.

ESTIMATED MARKET SIZE

As noted earlier, local wire and cable manufacturers are currently utilizing about 15,000 tonnes out of the 350,000 tonnes of cathode copper produced each year in Zambia. ZAMEFA currently operates at less than 40% of its installed capacity, and only utilized about 10,400 Mt of cathode in 2022, and Neelkanth, 4,500 to 4,800 Mt.

Included in the estimated market size are 43+ Mt of refined copper wires and cables imported into Zambia during 2021 (the most-recent available data is shown in Table 1). During 2021, there were no reported imports of refined copper wire (HS 740811 or 740819).

Table 1 - Zambia Imports of HS 741300 (refined copper stranded wire, cables) during 2021

Country of Origin	Imports (kg)
China	30,039
India	5,920
Tanzania	4,500
Japan	1,583
UAE	200
Switzerland	185
USA	151
Botswana	150
Brazil	33
RSA	5
Totals	43,088

Data compiled from World Bank's World Integrated Trade Solution database (<https://wits.worldbank.org>).

Electric Maintenance Lusaka (EML) is importing control cables and motor winding wires from South Africa due to these products not being manufactured in Zambia. EML, a major distributor, produces electrical panels and rewinding motor products for automation, instrumentation, power distribution, and other electrical systems. The order quantity is too small for a new company to invest locally. Current customers include distributors, contractors, mines, and the export market. Further research is needed on new product markets.

3.2. Domestic & Regional Competition Amongst Wire & Cable Manufacturers

Zambia remains key provider of both copper cathode and copper rod in the region but faces strong competition across product lines from both South African manufacturers and international wire and cable businesses (principally EU, China and USA).

While the overall market size would be modest, Zambia's location and ability to supply LME-certified cathode copper in SADC and COMESA markets is advantageous.

There is manageable competition as regards to copper rod supplies in the SADC and COMESA regions, though there is competition coming from Egypt and the Middle East, especially for the East African market. Presently, all exports of copper rod are supplied by ZAMEFA as Neelkanth and Uniflex has opted to convert 100% of the rod they produce to wire and cable.

DOMESTIC AND REGIONAL COMPETITION ALONG PRODUCT LINES

In terms of competition for wire and cable products within Zambia, this is currently between ZAMEFA and Neelkanth for products that the two companies are able to produce. However, within the region, South Africa is a major competitor, especially for export market for Zambian products.

South Africa has a more robust and better-developed local manufacturing sector with huge capacities for various products - some of which are not currently produced in Zambia, such as high voltage cables. This makes it difficult for Zambian products to penetrate this market and therefore only a few tonnes/year of wire and cable are exported into South Africa. Additionally, a good amount of cable is imported from South Africa by the mines as their procurement systems are centralized for the region.

The other major competitors are Egypt, India and Dubai, especially for the East African market. Even though Zambia has penetrated the East African market better than South Africa, there is a lot of competition from Egyptian products and the Middle East, which again are more-developed manufacturing countries compared to Zambia.

CHANGE IN PRODUCT MIXES

ZAMEFA has maintained a consistent product line for the past decade, with telecom cables discontinued in 2010. Neelkanth began operations in 2016 with LV, aluminium, and submersible cables for mines. They are building a new plant in Chilanga, Lusaka, to produce fiber optic and telecommunication cables, importing specialized copper wires. Uniflex Wire and Cables has added to the basket of products being produced locally. Apart from low voltage wire and cable products already being produced by the others, Uniflex has added other specialised cables such as solar cables and enamel wires.

THE ROLE OF TENDERS FROM ZESCO AND REA ON WIRE & CABLE DEMAND IN ZAMBIA

Zambia's power utility, ZESCO, has shifted its copper tenders to domestically manufactured products, with ZAMEFA winning most significant tenders. This change is due to Neelkanth's policy of not taking on price and exchange rate risks related to LME Grade A copper contracts. ZESCO contracts are fixed and firm pricing, forcing manufacturers to assume the risks of LME price fluctuations and US\$-Kwacha exchange rate volatility. Despite Neelkanth's reluctance to assume copper price risks, Neelkanth participates in small orders with shorter turn-around and delivery times. Both Neelkanth and ZAMEFA participate in ZESCO tenders for MV cables, but ZAMEFA imports the product from their sister company, African Cables, in South Africa. Over the past five years, ZESCO issued a total of US\$125.47 million worth of tenders for copper and aluminium products.

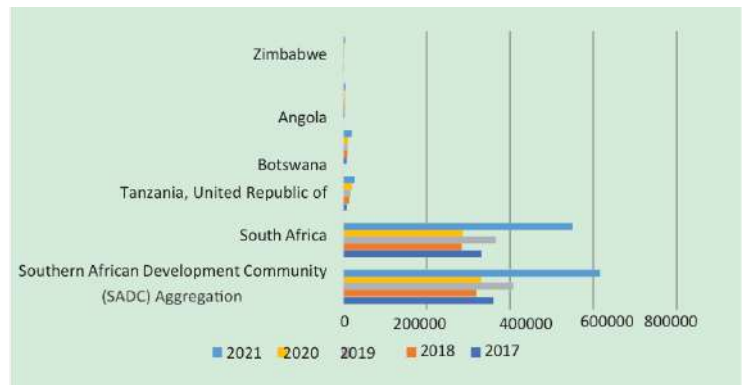
IMPACT OF LOCAL CONTENT LAWS IN THE REGION

Most countries in East Africa have enforced local procurement preference laws, which favour their local manufacturers especially as regards Government procurement. This has perpetuated the export of copper rod from Zambia instead of wire and cable in the region except for sizes of cable that local manufacturers in these markets are not able to produce or have limited capacity to produce. Local content requirements have therefore not helped much in terms of increasing Zambian wire and cable exports into the region leaving ZAMEFA and Neelkanth faced with limited choices: supply copper rod (limited value addition), consider possible manufacturing joint ventures/distributors, or not pursue new business in these countries at all. However, Zambia's 25% import duty on copper rods and cathodes has had the positive net result that there are no imports of copper rod into Zambia.

REGIONAL SALES AND MARKETING EFFORTS BY ZAMEFA & NEELKANTH

Zambia can increase its production of value-added copper products to target the SADC region, as South Africa is the leading importer. The country's minerals, mainly in raw form, have potential for development in various value chains. However, underperformance in the mining sector due to fiscal policy inconsistencies and operational challenges has led to lower earnings.

Figure 7 - Imports of Copper Wire in SADC



Source: UNComtrade and ITC trade map.

Zambia's major exporter ZAMEFA faced challenges in claiming back VAT refunds in the DRC due to VAT Rule 18 enforcement. However, changes to the rule may allow ZAMEFA to re-enter the market in future. Neelkanth is currently exporting wire and cable to the DRC and East Africa, while Angola has potential for wire and cable products. However, currency controls and poor road network make it difficult to develop markets.

COMPETITION IN REGIONAL WIRE AND CABLE MARKETS

ZAMEFA and Neelkanth actively market wire and cable products into Botswana, Uganda, Tanzania, Namibia, DRC, Kenya, Rwanda, Burundi, Ethiopia and South Africa. Within these markets, they compete against other wire and cable manufacturers from South Africa, China, India and Dubai. China, India and Dubai are the major competitors in East Africa. South Africa and China are the primary competition in Southern and Central Africa.

REFINED COPPER WIRE AND CABLE IMPORTS

As illustrated in Table 2 below, beyond ZAMEFA and Neelkanth's domestic production, Zambia imports small tonnages of refined copper wire (HS 740811 and 740819) as well as refined copper stranded wire and cables (HS 741300).

The majority of the stranded wire and cable imports (30 Mt) were sourced from China (see Table 3); South Africa provided 14 Mt of the 23 Mt refined copper wire imported by Zambia during 2021. Combined, the 66 Mt of refined copper wire and cable products imported during 2021 represent a tiny fraction of ZAMEFA and Neelkanth's production and sales.

Table 2 - Zambian Imports of Refined Copper Products by HS Code (2021)

HS Code	Product Definition	Imports
740710	Refined copper bars, rods, profiles	16,064
740811	Refined copper wire >6mm thickness	11,460
740819	Refined copper wire <6mm thickness	11,708
740911	Refined copper strips >0.15mm thick, in coils	50,630
741011	Refined copper foil <0.15mm thick	9,023
740919	Refined copper plates and sheets >0.15mm thick	48,213
741012	Refined copper foil >0.15 mm thick	0
741110	Refined copper tubes and pipes	29,609
741210	Refined copper tubes / pipe fittings (couplings, elbows, sleeves)	8,483
741300	Refined copper stranded wire, cables, etc.	43,088

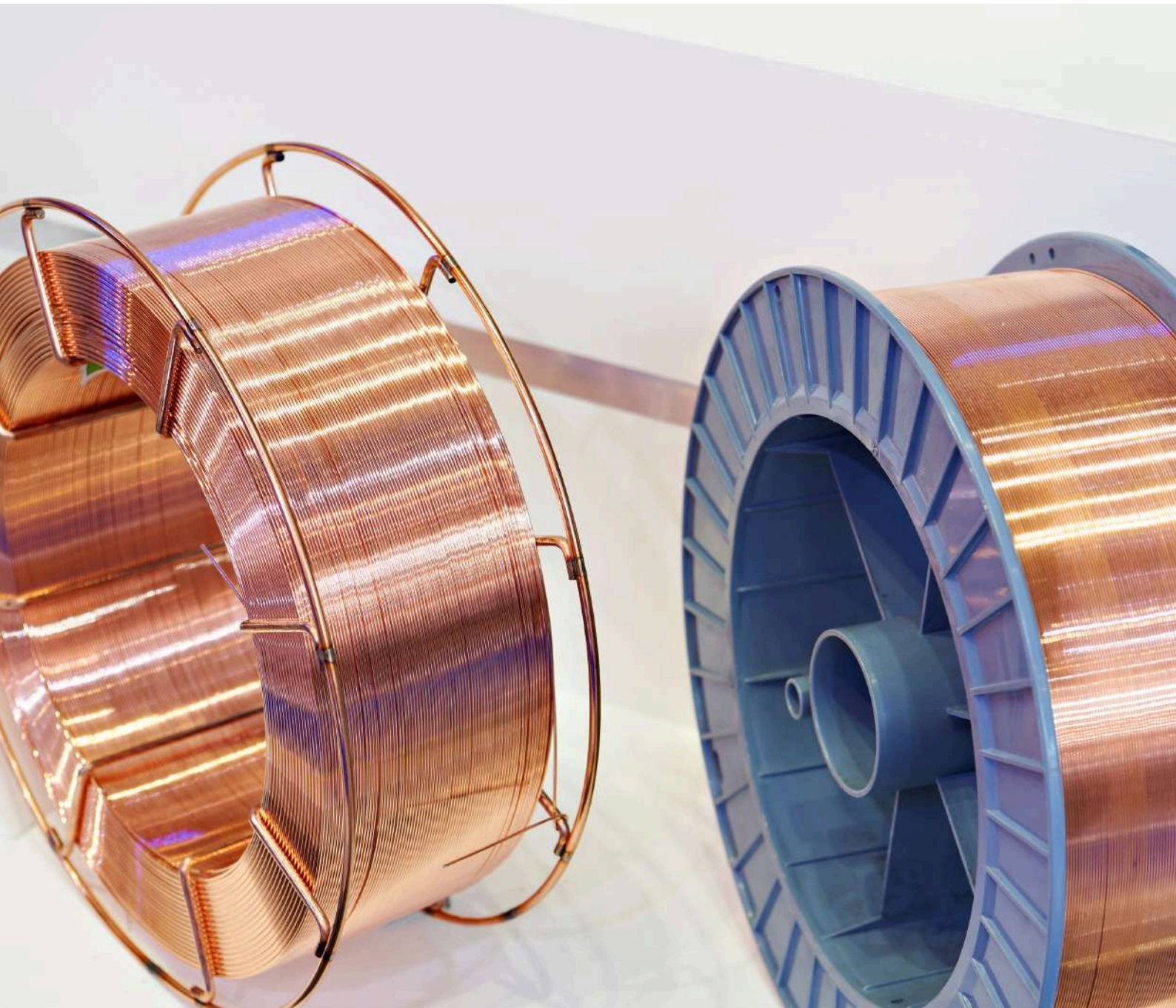
Data compiled from the World Bank's World Integrated Trade Solution database (Data compiled from World Bank's World Integrated Trade Solution database (<https://wits.worldbank.org>)).

Table 3 - Countries Supplying Refined Copper Products to Zambia in 2021 (data in kg)

HS Code	South Africa	China	India	Other Africa	EU	Rest of World
740710	3,490	10,260	1,143	0	0	1,171 (UAE, UK, Hong Kong)
740811	3,945	3,110	2,360	0	45	2,000 (UAE)
740819	10,283	430	1	994 (Tanzania)	0	0
740911	21,828	50	2,388	0	0	26,364 (Turkey, UAE)
740919	268	33,269	14,665	0	0	11 (UAE)
741011	0	0	9,023	0	0	0
741012	0	0	0	0	0	0
741110	20,191	8,541	500	0	377	0

HS Code	South Africa	China	India	Other Africa	EU	Rest of World
741210	4,370	3,619	392	0	101	1
741300	33	30,039	5,920	4,650 (Tanzania, Botswana)	216	2,230 (Japan, UAE, Brazil, USA)
Totals	64,408	89,318	36,392	5,644	739	31,777

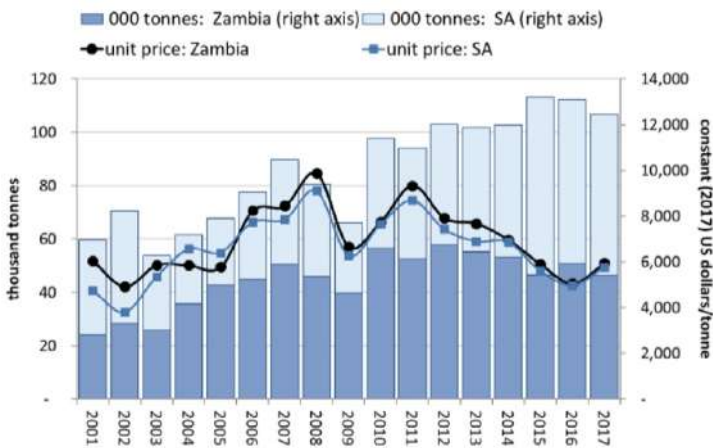
Data compiled from the World Bank's World Integrated Trade Solution database ([Data compiled from World Bank's World Integrated Trade Solution database \(https://wits.worldbank.org\)](https://wits.worldbank.org)).



3.3. Demand Side Constraints

Zambia and South Africa accounted for a small percentage of international semi-manufactured copper exports in 2017, with Zimbabwe producing some cables but not exporting. The European Union contributed 40%, followed by China, Taiwan, and the US. Demand for these products has been reduced by two factors since 2015. The decline in copper commodity prices after 2011 and a slowdown in GDP growth in southern Africa led to reduced domestic and regional demand for copper products. Between 2011 and 2017, Zambian revenues from exports fell by one-third, while South African exports remained relatively constant.

Figure 8 - Zambian exports of wire and insulated cable and South African exports of wire, pipes and cable, 2001-2017

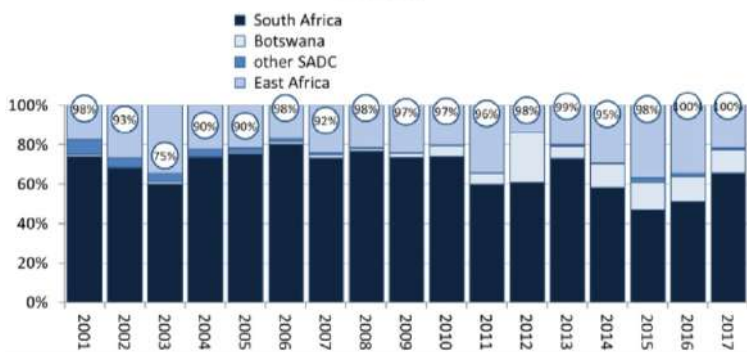


Source: data in thousands of Mt and constant 2017 US\$; from Makgetla et al. (2019), figure 6, page 6.

Another constraint on potential future growth of Zambian copper rod, wire and cable exports is where the products are sold.

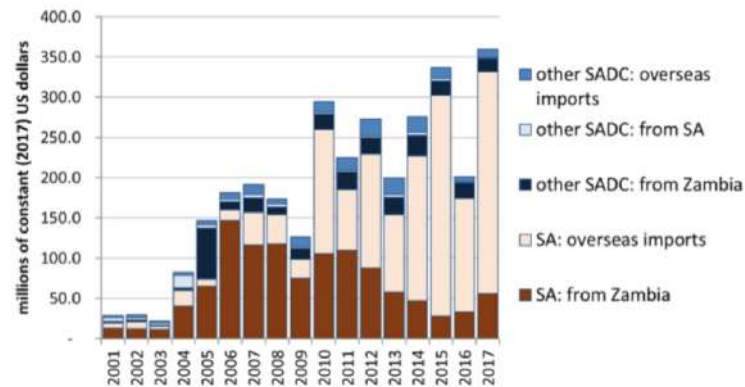
As shown in Figure 9 below, between 2001 and 2017, almost all of Zambia's exports went to SADC (Southern African Development Community) countries copper exports, while the majority of South Africa's exports of similar products were sold worldwide.

Figure 9 - Zambian and South African exports of semi-manufactured copper to SADC, by country within SADC, and as a percentage of each country's total semis exports, 2001-2017; from Makgetla et al. (2019), figure 7, page 8.



Zambian copper wire producers in Southern Africa are losing ground to overseas suppliers due to a shift from Zambia to larger, established, and better-financed international manufacturers. By 2017, their share of South African copper wire imports had fallen to 20%.

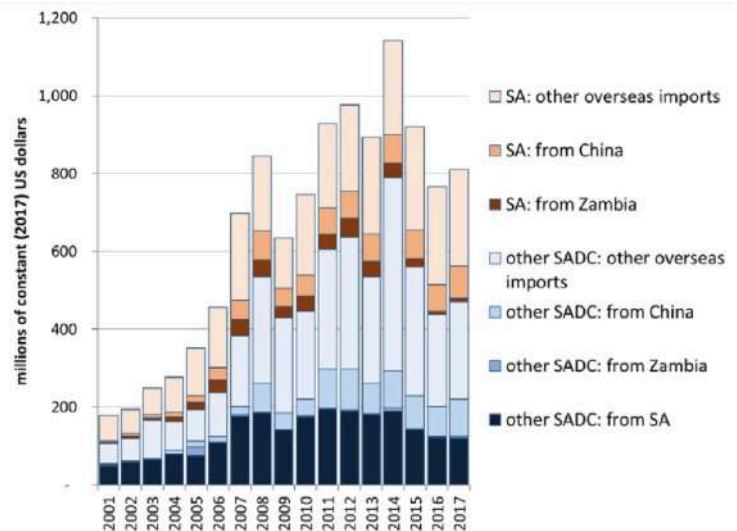
Figure 10 - Imports of copper wire by South Africa and other SADC countries by exporting country



Source: 2001-2017, in constant 2017 US\$; from Makgetla et al. (2019), figure 9, page 10.

SADC countries rely heavily on imported cable, valued at \$800 billion in 2017. China dominates the regional cable market, capturing a significant portion. Zambia has lost market share to South Africa, but maintains markets in other SADC countries. EU and American companies supply half of copper cable demand.

Figure 11 - Imports of cable by South Africa and other SADC countries by exporting country



Source: 2001-2017, in constant US\$ dollars; from Makgetla et al. (2019), figure 10, page 11.

Zambia's copper rod, wire, and cable manufacturers face competition from South African producers in the Southern Africa region, which accounts for less than 1% of global cable exports and 2% of international wire exports. The region's small markets present challenges for establishing new production capacity, especially for Zambian manufacturers Neelkanth and ZAMEFA.

4. CHALLENGES TOWARDS EXPANSION OF DOWNSTREAM VALUE-ADDED COPPER MANUFACTURING



There are a number of potential barriers to entry where the wire and cable sector is concerned. These range from general economic factors, laws and regulations, industry practices, standards, as well as availability of skills needed for high quality production of products.

4.1. Pricing and Access to Copper Cathode

In discussions with downstream manufacturers, the pricing and availability of copper cathode are common themes. Domestic off-takers should argue for mutually beneficial domestic sales at a discount, as the cost of acquiring cathode makes value-added copper products uncompetitive. Local manufacturers have argued that the discounts they should get from the mines are in the range of \$250 to \$350 per tonne which is a reflection of logistical costs to the nearest LME registered copper warehouses.

In-country research indicates ZAMEFA and Neelkanth have competitive local access to copper, but manufacturers are dissatisfied with low discounts, suggesting they need to negotiate and justify the low discounts to mines, especially if they don't reflect their comparative advantage.

4.2. Scale of Business vis-à-vis Cathode Pricing and Availability

Contrary to widespread perceptions, the core of the pricing issue is not due to market economics, but rather the inability of MSME's to commit to minimum order quantities and long-term contracts required by mining companies and smelters. Marginal buyers may not be looking for Grade A copper, and may instead be seeking scrap copper from mines. The availability of scrap copper is restrictive, but pyrolytic smelting is an efficient recycler of in-process scrap, reducing waste from smelters.

4.3. Transportation and Energy Costs

Zambia has made progress in infrastructure development, but rural road networks are neglected, with poor accessibility compared to its peers. The railway sector is underdeveloped and dominated by outdated infrastructure, while the energy sector lacks diversification. In 2020, hydro power dominated the national installed capacity, while coal, hydro fuel oils, diesel, and solar accounted for 10.9%, 3.6%, 2.78%, and 2.9%, respectively. This poor state of road, rail, and energy infrastructures hinders export growth. Connectivity to production centers remains a challenge, increasing the cost of exporting products. Shipping costs and delivery times can vary widely, with shipping charges to major seaports often exceeding \$200/Mt. Unpredictable shipping times pose difficulties for manufacturers. Electricity costs are lower than in South Africa, but power availability is a critical issue.

4.4. Skills Can Be a Potential Barrier to Downstream Development

The wire and cable sector in Zambia faces a significant skill shortage due to a gap between industry requirements and the quality of graduates from universities. The sector relies on artisans and engineers, with labor sourced from NORTECH, Copperbelt University, and The University of Zambia. ZAMEFA, the first downstream copper manufacturing company, has developed an in-house training program for workers. The sector has historically relied on expatriates for positions like Plant Manager, highlighting the need for more Zambians to take on management roles.

4.5. Applicable Standards, Laws and Regulations

Zambia's cable and wire sector faces challenges due to the diversity of regional and international standards and the high costs of compliance. The Standards (Compulsory Standards) (Declaration) Order, 2013 outlines packaging, marking, and general requirements for the sector. However, smaller manufacturers may struggle to afford inspection fees or in-house testing laboratories. ZAMEFA and Neelkanth have adopted regional and international standards to remain competitive. However, the biggest challenge is the lack of enforcement of required standards on imported products, with reports of Chinese-manufactured cables failing to meet conductivity and strength standards.

Figure 12 - Domestic, Regional and International Manufacturing Specifications and Standards for Wire & Cable Manufacturers



Source: ZAMEFA presentation

Manufacturers in Zambia face an uneven playing field, leading to sub-standard products being imported and sold at lower prices. To improve competitiveness, Zambia Compulsory Standards Agency (ZCSA) may need to increase its surveillance capacity.

4.6. Best Locations for New Market Entrants

Two companies, ZAMEFA and Neelkanth Cables, are located in the Copperbelt due to their proximity to copper mines and the ability to maintain stock. The best location for another plant is in Kitwe, which is the primary business center for the region. An alternative location for a manufacturing plant could be in the Lusaka South Multi-Facility Economic Zone (MFEZ), which offers additional incentives for new market entrants, improved logistics for importation and exportation of finished products, and no withholding tax on fees, consultancy, and interest repayments. The MFEZ also offers zero tax rates on dividends and profits.

4.7. Summary and Conclusions

Zambia's copper rod, wire, and cable manufacturing industry faces several barriers to entry. These include sourcing cathode regularly, maintaining competitiveness domestically, regionally, and internationally, and dealing with energy infrastructure, transportation logistics, and maintenance expenses. EU firms may have better access to lower-cost debt financing, but the local currency volatility and import procedures can be challenging. Skilled workers are scarce, and there is little turnover among experienced workers. The industry needs to adopt a sustainable business model, training Zambians for plant management and operation. Maintaining testing labs is a necessary cost for new producers. The Lusaka South MFEZ offers compelling reasons for new entrants to consider.



5. POTENTIAL INVESTMENT OPPORTUNITIES



Zambia's wire and cable manufacturers are undercapacity, presenting opportunities for investment and expansion. Entrepreneurs can secure copper cathode supplies, while the public sector can develop new market opportunities.

5.1. Opportunities Building on the Existing Production and Manufacturing Base

As noted earlier, local wire and cable manufacturers are currently utilizing about 15,000 tonnes out of the 350,000 tonnes of cathode copper produced each year in Zambia. ZAMEFA currently operates at less than 40% of its installed capacity, and only utilized about 10,400 Mt of cathode in 2022, and Neelkanth, 4,500 to 4,800 Mt.

Included in the estimated market size are 43+ Mt of refined copper wires and cables imported into Zambia during 2021 (the most-recent available data is shown in Table 1). During 2021, there were no reported imports of refined copper wire (HS 740811 or 740819).

INCREASE PRODUCTION FROM ZAMBIA'S SMELTERS TO MEET GLOBAL DEMAND FOR CATHODE

Zambia's copper production has been significantly impacted since 2015, with 400,000 Mt of copper exported in the form of blister or anode, and the final value-added refining and cathode premiums accruing to other countries. This has led to reduced tax and royalty revenues. Energy availability and pricing are the main challenges, along with lower treatment and refining charges outside Zambia, higher percentage metal payments by foreign smelters, and premium prices in Asian markets. Requiring smelters to refine 100% of production to the cathode stage could provide near-term value-addition to Zambia's copper production and ensure adequate copper cathode supplies for future downstream manufacturing or global markets.

PARTNER WITH OPERATING SMELTER / REFINERY - ADD CONTINUOUS CAST ROD MILL TO PROVIDE VALUE-ADDED INPUT FOR MANUFACTURING WIRE & CABLE PRODUCTS TO RESPOND TO GROWING REGIONAL AND GLOBAL DEMAND

EU investors and wire/cable manufacturers could partner with Zambia's copper smelting and refining complexes to add a continuous-cast rod mill for copper wire and cable production. This feed material could be used in Zambia or the EU, or sold regionally or globally. Zambia's three copper smelters and refineries produce LME Grade A copper cathodes, with Mopani representing the best opportunity, as production from the Chambishi and Konkola smelters is likely exported to China and India.

INCREASE PRODUCTION, EXPAND PRODUCT LINES AT EXISTING WIRE & CABLE OPERATIONS TO RESPOND TO INCREASING DEMAND AND ENTER NEW REGIONAL MARKETS

ZAMEFA and Neelkanth, two Zambian wire and cable manufacturers, are operating below their installed production capacities. A new market entrant could not compete with them unless they have proprietary technology or markets outside Zambia. However, they have potential near-term opportunities to increase production through increased volumes of existing products, adding new product lines, and increasing exports to regional markets. To increase production, they should focus on identifying and replacing imported products, such as refined stranded copper wire and cables. As the energy transition accelerates and electric infrastructure in Zambia and the southern Africa region is built out, they could partner with existing EU wire and cable companies with proprietary technology and markets.

UPGRADE COPPER CATHODES INTO VALUE-ADDED BASIC SEMI-MANUFACTURED PRODUCTS

Copper cathodes are primarily used for wire rod production, with over 60% of global production being converted into standardized 8mm diameter rods. The second most common use is billets and cakes for producing strips, bars, and tubes. Zambia has no reported exports of copper billets in 2021. Upgrading copper cathodes into wire rods and shapes could increase value by several hundred dollars per tonne. New manufacturers could scale up copper cathode value, but Zambia's competitiveness in copper semi-manufactured products may be limited by shipping costs and transportation logistics.

5.2. Opportunities Structured Around the Circular Copper Economy

Zambia's copper smelters offer four circular economy investment opportunities in the near-term, utilising abundant raw materials and downstream products to supply domestic and southern African markets. Longer-term potential includes implementing new service models and developing a regional industrial system.

A. Smelter Circularity - Developing New Uses and Markets for the 1,500,000 to 2,000,000 Tonnes of New Slag Generated Each Year

Copper slag, a by-product of copper extraction, is produced by Zambia's four copper smelters, which have an annual production capacity of around 1.2 million Mt. As copper production increases, the smelters could produce between 2.4 and 3.6 million tonnes of new slag each year, most of which will be sent to landfills or stockpiled at mine sites. However, slag has value and potential secondary uses, such as being comparable to natural minerals and being durable, strong, and hard. It could have widespread applications in the construction sector, such as road construction, asphalts, soil stabilisation, and hydraulic engineering.

Aurubis, one of the world's largest copper recyclers, has developed an innovative business model for reprocessing by-products, which could be a viable investment option for EU companies to partner with mining companies in Zambia. By promoting circular practices through industrial symbiosis, copper slag can contribute to the circular economy, reduce waste in the copper industry, and reduce carbon emissions and environmental impact. By exploring the possibilities of copper by-products, Aurubis could be an effective partner for Zambian mining companies generating significant amounts of slag each year.

B. Refinery Circularity - Constructing a New Anode Slimes Refinery to Process Valuable By-Product Materials Currently Being Exported

Anode slimes are by-products of the electrolysis process where pure copper is deposited on cathode plates, with impurities accumulating on the bottom of refining cells. These slimes are recovered, dried, and processed in a metals by-product plant. Common recovered metals include precious metals, lead, antimony, selenium, bismuth, tellurium, and arsenic. A treatment plant in Ndola, Zambia, operated until the 1990s but closed after privatization. Currently, all anode slimes recovered from Zambia's smelters are exported, with 70% sent to South Africa and 20% to India and Ukraine. KCM estimates that for every 450 tonnes of copper anodes treated at Nkana Refinery in Kitwe, 1 tonne of anode slimes containing gold, silver, copper, selenium, palladium, and platinum is recovered. If all four Zambian copper smelters were operating at capacity, potentially 2,500 to 3,000 tonnes of anode slimes could be available for in-country processing and metal recovery.

C. Export By-Product Sulphuric Acid in Response to Growing Supply-Demand Gap

Sulphuric acid (H_2SO_4) is produced from copper concentrates smelting, with KCM using it to leach tailings and Mopani Copper Mines selling it to local mining companies. A study predicts global demand for sulphuric acid will increase from 246 to 400 million tonnes by 2040 due to intensive agriculture and a shift away from fossil fuels. Zambia's fragmented market for sulphuric acid presents an opportunity for a non-copper manufacturing business to formalize the market and re-sell H_2SO_4 . Its applications include fertilizer production, chemical industry products, pharmaceuticals, and paper production.

D. Re-process Copper Mine Tailings and Waste Dumps to Produce Copper Cathode for Downstream Manufacturing or Sale into Global Markets

KCM operates the Nchanga Tailings Leach Plant in Zambia, which reprocesses historic copper tailings from mining operations. Commissioned in 1986 to begin reprocessing of an estimated 140 million tonnes of tailings the plant has a design capacity to produce 40,000 Mt of cathode copper annually. As mined ore grades in the Copperbelt decline (in the case of KCM, from about 6% Cu in the early to mid 1900s to 2% or less today), reprocessing copper tailings offers a profitable business opportunity to recover additional metal, remediate old tailings piles, and facilitate alternative uses for land. Jubilee Metals Group plc, a recent market entrant, focuses on reprocessing historic copper tailings and waste dumps to produce copper concentrates and cathodes. The company acquired the multi-metal Sable Refinery from Glencore in 2019 and plans to increase production from tailings reprocessing to approximately 25,000 Mt/year over the next four years. The minimum size for a tailings reprocessing plant is estimated to be between 5,000 to 7,500 Mt Cu/year, with corresponding capital costs. Copper produced from tailings reprocessing and/or ASM producers could represent new sources of supply for copper wire manufacturers, provided that the cathode quality meets each company's requirements.

5.3. Potential Investments Structured Around New Circular Business Models

The success of a business model depends on factors like market conditions, regulatory environment, technological advancements, and management expertise. Recycling has the potential to extend resource use, minimize energy use, and reduce emissions. Investing in high-level business models like integrated mining and processing can provide better cost management, supply chain control, and economies of scale. Copper recycling and the circular economy model can also be promising, as it reduces the need for new mining and minimizes environmental impact. Investing in copper processing and smelting facilities can add value to raw copper concentrates and export refined copper. Zambia currently exports about 400,000 Mt of blister and anode copper, and 350,000 Mt refined to the cathode stage. There are three potential copper circularity investment opportunities for EU businesses and investors.

A. Establish Regional Scrap Collection & Reprocessing Centre in Zambia

Zambia could establish a regional scrap collection center to recover and re-use copper and precious metals from electronic waste and consumer goods. This would create jobs and support regenerative industrial systems. The current copper scrap and e-waste recycling market is estimated to be around US\$6 million, with potential opportunities for circular economy recycling infrastructure, improved recycling management, and technology. However, the lack of comparable e-waste management legislation and voluntary industry initiatives could hinder Zambia's growth as a regional e-waste collection and reprocessing centre.

B. Circular Business Model: Products as a Service (Rio Tinto / Schneider Electric)

The Rio Tinto / Schneider electric products as a service circular business model is an example of investment option for EU companies to partner with mining companies in Zambia to ensure guaranteed copper supplies. In the case of Rio Tinto and Schneider, a partnership agreement was signed to develop a circular and sustainable market ecosystem for both companies and their customers. Rio Tinto supplies copper to Schneider Electric, which sells products ranging from electrical car chargers to industrial robotics. In return, Schneider Electric provides energy and industrial services to Rio Tinto as the companies work together to create digital platforms, technologies and solutions across the mining supply chain in pursuit of de-carbonization.

We believe that the leading Zambian copper producers - First Quantum Minerals and Barrick Gold, MCM- would be excellent prospective partners, at such time as the ownership situations at KCM is resolved, this mining company could also be a potential partner.

C. Establish a Fully Integrated Smelting and Refining Industrial System

The southern African region should establish regional mining and downstream processing hubs, designed around regenerative industrial systems, to counter China's dominance in downstream processing. This could benefit multiple regions, such as Zambia, DRC, RSA, and EU, and serve as a counterweight to China's dominance. Future partnerships between EU and RSA manufacturers could benefit from selling into EU, BRICS, COMESA, and SADC markets. Inclusion of the DRC and Zimbabwe in such a venture could allow economies of scale and certainty of supplies for EV battery production. A regenerative industrial system is crucial for a sustainable future.

Annex E contains the business opportunities, as developed in parallel to the market assessment.



6. GOVERNMENT POLICIES ON DOWNSTREAM VALUE-ADDED COPPER MANUFACTURING



Zambia has implemented fiscal measures to boost copper transformation, including in 2013 imposing a 10% export duty on copper concentrate exports.

The government's policies focus on downstream value-added manufacturing in the copper sector, dominated by the Eighth National Development Plan (8NDP) and the 2022 Mineral Resource Development Policy (MRDP). The 2022 MRDP addresses new issues like the EV value chain, artisanal mining, and the declaration of gold as strategic minerals. It also aims to increase copper production to 3,000,000 Mt/year by 2031.

6.1. Stabilise the Mining Fiscal Regime

The mining sector is crucial for foreign earnings and is a major contributor to the domestic resource envelope. However, due to policy inconsistencies and poorly structured tax incentives, Zambia has not maximized the sector's revenue potential. Therefore, there is a need to stabilize the mining fiscal regime and review the numerous tax incentives that contribute to lower tax revenues. Examples are included below.

6.2. Potential Policy Amendments to Promote Copper Value-Addition

Zambia's copper sector could benefit from several policy changes to support downstream value-added manufacturing. These include requiring all mines and smelters to refine copper to the cathode stage; requiring mines to produce rod, wire, or cable; further reducing the Corporate Income Tax (CIT) for copper cathode used in the country by local businesses; reducing production royalties to encourage increased supply of cathode; supporting R&D and related skills development; targeting fiscal incentives; considering public-private partnerships (PPPs); encouraging downstream linkages; and supporting local investment in the copper value chain.

Zambia's current high royalty regime on copper production and the added costs of developing and operating mines in a land-locked country make it a disincentive to investment. To address this, the government could consider adding a new export duty on blister and anode copper or reducing production royalties for copper sold and exported as cathode. Additionally, the government could consider implementing public-private partnerships (PPPs) with Zambian-owned businesses to assist in the development of new copper manufacturing businesses.

Furthermore, the government could encourage downstream linkages, such as copper plumbing, to manufacturing industries that could use new copper products produced in Zambia. This could encourage commercial and residential builders to shift their material preference to copper products. Lastly, local participation in the copper value chain is urgently required to fully benefit the people of Zambia. Annex D unpacks these policy recommendations.

7. CONCLUSIONS AND RECOMMENDATIONS

Zambia, one of the world's top 10 copper producers, faces challenges in expanding its downstream copper manufacturing operations due to limited resources and a dependence on imports. However, there are potential investment opportunities related to the circular economy.

The country consumes only a small amount of copper cathode each year, exporting the remaining 95%. The two principal copper fabricators, Metal Fabricators of Zambia (ZAMEFA) and Neelkanth Cables, purchase only 15,000 Mt of copper cathode for domestic use and export to regional markets. Both companies operate at 50% or less of design capacity, with Neelkanth capturing a fair amount of annual sales from ZAMEFA.

The availability of copper scrap in Zambia is extremely limited, and both copper smelters and downstream manufacturers can recycle any scrap or waste copper generated. Upstream producers and downstream manufacturers collect, reprocess, and reuse copper waste and scrap generated in copper smelting/refining processes and manufacturing/recycling of copper wires and cables.

Zambia has considerable unutilized refining capacity, which could be unlocked if the argument for increased production of semis in Zambia were strong. However, Zambian downstream manufacturers face increased competition from South Africa and Asian countries producing wire and cable products.



To address domestic demand, Zambia could increase production to respond to electrification efforts or jump-start manufacturing using a more regional perspective. Compliance with local content laws would require joint ventures or partnerships, but compliance may only be feasible for large export volumes. In upstream manufacturing, increasing Zambia's cathode production could have the greatest impact on value-addition to copper production.

Zambia has several investment opportunities related to the circular economy, including developing new uses and markets for slag produced in the copper smelting process, generating valuable waste products like anode slimes, and reprocessing copper-bearing mine tailings and waste rock dumps. As Zambia's copper production increases, construction of a new anode slimes refinery could be viable. Additionally, the country has an estimated 1.9 billion tonnes of copper-bearing mine tailings and waste rock dumps that can be profitably reprocessed to produce copper cathode. Formalizing Zambia's scrap metal collection system and e-Waste streams could be a potential ground-floor opportunity.

Investors should consider partnering with Neelkanth and/or ZAMEFA to investigate joint development and manufacturing of new wire and cable products. In the long run, electrification, green technologies, and growth in machinery and equipment manufacturing are expected to boost copper wire, cable, and rod demand in Zambia and the southern Africa region. Both companies could benefit from increasing production of existing products and developing new products independently or in association with an EU manufacturer or investor. However, further expansion requires alleviating constraints around regulatory frameworks, energy, logistics, technological capacity, and measures to reduce copper prices for local fabricators.

A hand is shown holding a large, dense bundle of copper wires. The wires are tightly packed and appear to be part of a cable or a bundle of conductors. The background is a solid, dark blue color. The word "Annex" is centered in the middle of the image in a white, sans-serif font. Two vertical white lines are positioned above and below the word "Annex", extending towards the top and bottom edges of the image respectively.

Annex

Annex A Mine Production of Copper (Mt) from the “New Copperbelt” Region of Zambia (2005 - 2021)

Year	Lumwana	Kansanshi	Sentinel	NCB Total	Zambia (100%)	NCB Share
2005		77,800		77,800	465,002	17%
2006		126,900		126,900	497,169	26%
2007		163,800		163,800	524,000	31%
2008		215,300		215,300	567,700	38%
2009	109,413	245,000		354,413	601,200	59%
2010	146,690	259,000		405,690	767,008	53%
2011	117,022	229,600		346,622	663,400	52%
2012	81,144	260,300		341,444	695,200	49%
2013	117,968	269,500		387,468	759,800	51%
2014	97,069	259,000		356,069	708,259	50%
2015	130,181	221,600	32,971	351,781	710,860	49%
2016	122,924	252,200	139,600	514,724	725,359	71%
2017	116,120	251,200	190,683	558,003	797,266	70%
2018	101,605	252,400	223,656	577,661	875,848	66%
2019	107,955	232,200	220,006	560,161	789,942	71%
2020	125,192	221,487	251,216	597,895	868,671	69%
2021	109,769	202,159	232,688	544,616	800,696	68%
2022	121,109	146,282	242,451	509,842	770,000	66%

Data compiled from British Geological Survey [World Mineral Production](#) (various years)

Annex B Mine Production of Copper (in Mt) in Zambia, DRC, Africa and World (2000 - 2021)

Year	Zambia	DRC	Africa	Zambia Share of Africa	World	Zambia Share of World
2000	249,304	33,000	460,782	54%	13,206,324	2%
2001	306,909	37,845	531,880	58%	13,652,544	2%
2002	307,834	27,359	476,519	65%	13,516,923	2%
2003	346,900	16,359	504,361	69%	13,637,943	3%
2004	410,300	18,995	556,897	74%	14,524,236	3%
2005	465,002	97,500	697,394	67%	14,958,389	3%
2006	497,169	142,300	774,983	64%	15,066,687	3%
2007	524,000	144,600	839,095	62%	15,502,548	3%
2008	567,700	239,200	1,007,053	56%	15,602,299	4%
2009	601,200	299,300	1,103,134	54%	15,803,948	4%
2010	767,008	378,300	1,375,448	56%	16,102,375	5%
2011	663,400	499,198	1,376,319	48%	15,989,615	4%
2012	695,200	619,942	1,529,623	45%	16,753,333	4%
2013	759,800	922,016	1,927,709	39%	18,295,037	4%
2014	708,259	1,030,129	2,037,252	35%	18,566,941	4%
2015	710,860	1,039,007	2,016,746	35%	19,290,689	4%
2016	725,359	1,023,687	1,959,792	37%	20,397,208	4%
2017	797,266	1,094,638	2,068,110	39%	20,186,250	4%
2018	875,848	1,225,227	2,289,529	38%	20,779,088	4%
2019	789,942	1,420,386	2,380,600	33%	20,703,167	4%
2020	868,671	1,601,208	2,658,749	33%	21,043,278	4%
2021	800,696	1,797,836	2,840,801	28%	21,359,362	4%

Data compiled from British Geological Survey World Mineral Production (various years)

Annex C Mine, Smelter and Refined Copper Production (Mt) in Zambia (2000 - 2021)

Year	Mine Production	Smelter Production	Refined Production	Refined Surplus (Deficit)
2000	249,304	180,000	226,169	46,169
2001	306,909	203,000	307,904	104,904
2002	307,834	245,000	347,235	102,235
2003	346,900	245,000	360,100	115,100
2004	410,300	280,100	409,500	129,400
2005	465,002	244,800	445,600	200,800
2006	497,169	289,700	497,200	207,500
2007	524,000	224,000	523,400	299,400
2008	567,700	232,000	575,000	343,000
2009	601,200	402,000	689,600	287,600
2010	767,008	535,000	767,000	232,000
2011	663,400	520,000	516,400	(3,600)
2012	695,200	519,200	530,200	11,000
2013	759,800	520,300	567,800	47,500
2014	708,259	525,800	499,400	(26,400)
2015	710,860	648,800	495,600	(153,200)
2016	725,359	698,100	426,400	(271,700)
2017	797,266	787,900	466,200	(321,700)
2018	875,848	828,700	458,200	(370,500)
2019	789,942	638,500	264,500	(374,000)
2020	868,671	750,600	378,400	(372,200)
2021	800,696	760,000	350,000	(410,000)

Data compiled from British Geological Survey [World Mineral Production](#) (various years)

Annex D Potential Policy Amendments to Promote Copper Value-Addition

There are a number of areas where policies, laws and regulations might be amended or modified to further support and encourage downstream value-added manufacturing in the copper sector, including:

(1) Require All Mines / Smelters to Refine Copper to the Cathode Stage

Prior to 2015, essentially all copper mined and smelted in Zambia was refined and exported as cathodes. Since that time, a significant gap has developed, with approximately 400,000 tonnes of production exported at the blister or anode stage. As a result, the final stages of value-addition on this metal is done elsewhere (representing treatment and refining charges), and the cathode premiums (currently in the neighbourhood of US\$180-US\$200/Mt) are taxed in other countries

There is precedent for requiring refining to the cathode stage – in 2013, the Government introduced a 10% export duty on copper concentrates in an effort to encourage increased in-country value-added smelting and refining

In this case, the Government might consider adding a new export duty on blister and anode copper, or alternatively, a reduction on production royalties for copper sold and exported as cathode.

(2) Require Mines / Smelters to Produce Rod, Wire or Cable

This would require strengthening of the 2018 budget provisions of the Ministry of Finance and National Development, which reduced the Corporate Income Tax from 30% to 15% for companies that add value to copper (e.g., wire and cable).

Increasing the value-addition requirements for mining companies to produce at least 100% cathode (ideally, copper rod) would likely spur increased domestic investments in rod, wire and cable manufacturing within Zambia, producing value-added products for export beyond Africa.

(3) Reduced CIT or Royalties for Copper Cathode Used in Country by Local Businesses

There could be issues with monitoring and enforcement, but the general concept would be to offer financial incentives for mining companies and smelters to engage with and support Zambian-owned (or majority-owned) businesses engaged in value-addition of copper. The forms of support could take many forms – from selling at LME prices (without cathode premiums), investments in new businesses, guaranteed supplies of copper, and more.

(4) Reduced Production Royalties to Encourage Increased Supply of Cathode

Zambia's current royalty regime on copper production is amongst the highest in the world and combined with the added costs of developing and operating mines in a land-locked country, the current high royalty rates are a disincentive towards investment. The frequent revisions to the royalty regime (and the overall mining fiscal regime) over the past 20 or so years serve as a further disincentive to investment. Establishing a stable and equitable tax and royalty regime would assist Zambia in reaching its 3,000,000 Mt/year production goal.

(5) Support R&D and Related Skills Development

Increased Government support into new technologies and manufacturing processes to enhance and grow Zambia's copper manufacturing sector.

(6) Targeted Fiscal Incentives

Consideration might be given to additional tax cuts (direct and/or indirect taxes) to spur investment in downstream manufacturing activities – perhaps something available nationwide and comparable to the incentives available within Zambia’s SEZ’s and MFEZ’s.

(7) Public-Private Partnerships (PPP)

Because of the financial challenges faced by small businesses (high costs of capital, volatile exchange rates), the Government may want to consider PPPs with Zambian-owned (or majority-owned) businesses to assist in development of new copper manufacturing businesses. Beginning with the first stage of copper value addition (rod, wire, cable and castings), such program(s) could be expanded downstream as the manufacturing sectors, economy and markets develop over time.

(8) Encourage Downstream Linkages

The intended focus would be on manufacturing industries that could use new copper products produced in Zambia – for example, copper plumbing (pipes, joints and fittings).

The commercial and residential building industries are currently oriented towards plastic and galvanized steel plumbing, and Zambia’s Public Housing Authority specifies galvanized iron or plastic tubing in tenders. Engaging with the PHA to expand or change its requirements to include locally produced copper plumbing products might encourage commercial and residential builders to shift their material preference as well (although the cost and affordability of similar copper products are likely to remain a barrier to such transitions).

(9) Support and Encourage Local Investment in the Copper Value Chain

Except for ZCCI-IH’s minority equity stakes in several large mines, foreign ownership predominates.

Even downstream, ZAMEFA’s South African parent company holds 75% of the business, and Neelkanth is entirely foreign owned.

Local participation in the copper value chain is barely seen, but urgently required in order for the people of Zambia to more-fully benefit from the production and value-addition to copper resources within its borders.

Annex E Investment Opportunities Identified through the Market Assessment

Investment Opportunity n.1: Smelter Circularity - Developing New Uses and Markets for Copper Slag

1. Project Description

Zambia, the world's 7th-largest copper producer, is sitting on a treasure trove of copper slag, a by-product of the copper smelting process. Traditionally seen as waste, this copper slag is a resource waiting for innovative reuse and recycling applications. The opportunity lies in transforming this slag into valuable products for various industries, thereby contributing to Zambia's circular economy and sustainable development goals. Typically, 2 to 3 tonnes of slag are generated for every tonne of copper produced. Most new slag is sent to landfills or stockpiled at mine sites. Throughout Zambia, there are significant accumulations of slag that could be re-purposed and re-used, ie replacing natural aggregates in construction, hydro engineering, asphalt.

The retreatment of copper slag in Zambia could focus on establishing a facility that processes copper slag for use in the construction industry, particularly in cement and concrete production. Copper slag (CS) holds significant potential for reuse, especially in cement-based materials, providing a sustainable pathway for its utilization. CS can be used as supplementary cementitious materials to reduce cement consumption and enhance the properties of CBMs. The application of CS in cement-based materials doesn't only improve the working properties, mechanical properties, and durability of these materials but also offers an eco-friendly solution to the disposal problem of CS.

The Opportunity & Business Model

The Opportunity lies in harnessing copper slag for commercial applications, significantly reducing environmental waste and supporting the circular economy. Throughout Zambia, there are significant accumulations of slag that could be re-purposed and re-used, ie replacing natural aggregates in construction, hydro engineering, asphalt. Traditionally considered waste, copper slag has various potential applications in construction, abrasive tools, road building, and as a cement extender. The project envisions transforming this underutilized resource into a valuable commodity, creating a sustainable business model that leverages Zambia's abundant copper slag reserves.

Business Model

The proposed business model focuses on processing and refining CS into either refined copper or products for construction, abrasive materials, and other industrial uses. This venture will capitalize on Zambia's vast copper slag reserves, creating a sustainable business that not only turns waste into wealth but also aligns with global sustainability trends.

The reprocessed and refined copper slag can be sold directly to end-users or through distribution partners in the construction, manufacturing, and infrastructure sectors. The advantages of copper slag recycling efforts are both environmental and economic: reprocessed slag can replace other more-costly inputs used to make building materials, and recycling the slag also minimizes waste and disposal costs. However, not all copper slags may be amenable to recycling / re-purposing / re-use.

Market Size

The market size for this initiative could be substantial, given the volume of copper slag produced annually and the growing demand for sustainable building materials. Typically, 2 to 3 tonnes of slag are generated for every tonne of copper produced. Based on the estimate that 2 to 3 tonnes of slag are generated for every tonne of copper produced, and with an estimated copper production of 3 million tons in 2030, the approximate volumes of slag that may be generated in 2030 would be between 6 million tons and 9 million tons. Major copper producers like First Quantum Minerals, Barrick Gold, and Mopani Copper Mines are key stakeholders in the industry whose activities could influence the slag retreatment market. From research, the below figures were quoted and need to be verified.

There are 9 slag dumps , containing approximately 40 Million Tonnes of slag and cover an area of approximately 279 ha.

While specific figures on the copper slag market size in Zambia, East, and South Africa might require detailed market research, the region's growing construction and infrastructure development sectors indicate a substantial potential market. Zambia's role as a major copper producer ensures a steady slag supply, with neighboring countries potentially serving as additional markets or sources of raw material. The construction and infrastructure sectors in Zambia, East, and South Africa present a significant market opportunity. The region's growing demand for construction materials, coupled with an increased focus on sustainable and environmentally friendly products, creates a ripe environment for copper slag-based products.

Supporting Infrastructure

Power: Access to Zambia's electrical grid and potential renewable energy sources.

Labour: A ready workforce for both skilled and unskilled labor, supported by local training programs.

Transportation: Utilization of Zambia's road network and its strategic location for exporting to neighboring countries.

2. Required Investment(s) and Deal Structure

The initial phase is estimated to require an investment of \$20 million to \$50 million, covering plant setup, machinery, and working capital.

Joint Venture investment sharing

Deal Structure: A flexible approach, combining equity investment for startup and operational costs, and debt financing for capital expenditures. Joint ventures with local or international partners are also considered to leverage expertise and market access. An example is Jubilee whose business model is based on both acquisitions of the copper slag and strategic partnership with a Financier.

3. Estimated Returns (Business Case)

Given the complexity of such an investment, conducting a full feasibility study tailored to Zambia's context is required. Potential returns on such an investment depends on various factors, including the grade of the slag, characteristics of the slag, which then determines the processing cost based on technology required. Some innovative processing solutions maybe required. It would be crucial to conduct a detailed feasibility study to validate the opportunity. This study was restricted to high level opportunities and more detailed slag analysis and characterization, costing, business modelling, ROI, etc. would need to be done to determine if the opportunities are worth pursuing.

This is the current case with one big player conducting extensive work as part of their feasibility study. A high level conservative market penetration and pricing strategies, the project targets a return on investment (ROI) within 5 to 7 years.

The recycling and treatment of copper slag, involve considerations regarding the technology used, the physical and chemical properties of the slag, and its suitability for various applications. Understanding these aspects can help in estimating the operational requirements and potential revenue streams from the sale of treated slag products.

Potential good returns can also be extracted from big global players such as Aurubis conducts copper smelting and refining at their various production sites across Europe. The company produces, Iron silicate, a copper byproduct, from processing copper slag, which is produced during the copper smelting and refining process.

Iron silicate is a manufactured mineral that is comparable to natural minerals. It can be produced as a stone, similar to igneous rock; as a granulate, similar to a natural volcanic glass; or as a fine powder, similar to mineral flour. Locally, in Zambia, Jubilee has recently acquired some copper slag for retreatment.

4. Environmental, Social and Governance Impact

Recycling reduces the amount of waste sent to landfills, reduce pollution and emissions that contribute to climate change, save natural resources, such as timber and water, and keep our environment healthy by reducing the need to create new materials. Investing in copper slag retreatment in Zambia represents a sustainable business opportunity with potential economic and environmental benefits.

Social Impact:

Job creation across the value chain, from processing to logistics.

Skill development programs in partnership with local institutions.

ESG Contributions:

- Reduced environmental impact by recycling copper slag. Recycled material up to 96% lower CO2 footprint vs primary materials

By reusing copper slag, which would otherwise be discarded in a landfill, iron silicate can contribute to reducing waste in the copper industry and saving natural resources in the construction industry. Approximately 170,000 tonnes of CO2 equivalent can be saved if iron silicate is used as an iron additive in blended cements, and 116,000 tonnes of CO2 equivalent can be saved if iron silicate is used as a substitute for cement in concrete. It helps make concrete denser and stronger, making it an ideal additive for shielding concrete which is used in structures to help protect against natural disasters, military attacks and radiation in hospitals or laboratories. It is also used in de-icing concrete to help make the concrete electrically conductive and is used to de-ice bridges and sidewalks.

- Lowered industrial waste and minimized landfill use.

Positive contributions to Zambia's economy through increased local manufacturing and exports.

- Increased Tax for Government:

Enhanced revenue through business operations and exports.

5. Tax Incentives for Copper Beneficiation

Exploring partnerships with the Zambian government to secure tax incentives for beneficiation and recycling processes, aligning with national goals for economic diversification and sustainable development.

6. Other Government Support

Support Required:

Infrastructure improvements, particularly in power and transport.

Regulatory support for recycling initiatives and circular economy business models.

7. Estimated Timelines

Pre-feasibility and Feasibility Studies: 6-12 months.

Design and Construction: 18-24 months.

Permitting and Regulatory Approvals: 12-18 months, concurrently with other phases.

Launch: Targeting operational status within 3 to 4 years from project inception, subject to timely permitting and construction.

The above depends on various factors including grade and quality of copper slag

Investment Opportunity n.2: Re-process Copper Mine Tailings and Waste Dumps to Produce Copper Cathode for Downstream Manufacturing or Sale into Global Markets

1. Project Description

The project entails the reprocessing of copper mine tailings and waste dumps in Zambia, aiming to recover copper and produce high-grade copper cathode. An example is Jubilee Metals Group, which is unlocking value through retreatment of and metals recovery from mine tailings, waste, slag slurry and other secondary materials from historical mining activities. The company has secured rights to approximately 150 million tonnes of copper-containing tailings. This initiative represents a strategic move to leverage Zambia's vast copper resources and Jubilee Metals Group's expertise in metal recovery and refining. Jubilee Metals Group estimates that there are over 1.9 billion tons of mine waste dumps and tailings piles in Zambia, containing over 7 million tonnes of copper. Historical tailings estimated to be in excess of 600 million tonnes at surface. These historic waste dumps and tailings piles offer opportunities for copper recovery (some tailings piles may contain recoverable quantities of cobalt) and environmental remediation.

Zambia is projected to achieve the government's target of 3 million tons of copper output per year from 760,000 tons in 2022. If Zambia could reach the projected copper production target, consequently, an increase in copper production means increased waste generation. Different tailings from different dams have dissimilar properties making tailings from each dam unique.

The Opportunity & Business Model

The amount of tailing produced in the copper extraction process can be as high as 196.5 tons of solid and liquid tailing for every ton of copper extracted. With the projection of 3million tons of copper produced by 2030, tailings generated will amount to more than half a billion tons of tailings. Waste generation from copper production in Zambia was at its highest in the early 1990s when the country produced an estimated 38 million tons of solid wastes per annum of which 90% was mining waste including copper tailings which ended up in tailing dams. There are at least 21 waste rock dumps covering more than 388 hectares, 9 slag dumps covering 279 hectares and more than 45 tailing dams covering an area estimated at 9,125 hectares in Zambia.

Jubilee has become the expert on reprocessing tailings dumps. By processing remnant mining residues and waste material, this business not only addresses the physical legacies of historical mining operations by rehabilitating the environment and clearing away pollution, but also improves the quality of life of those living in proximity of these operations. The company implemented solutions that extract value from these waste tailings that were regarded by others as too complex or too low in value. This project specifically targets the recovery of copper and cobalt from tailings or waste rock discarded by the mining industry due to the materials' inherent metallurgical complexity and expected low commercial value.

Innovation and processing excellence is at the centre of the business model to be successful. Jubilee has that competitive advantage as over the years has developed a commercially viable process solution to extract these complex copper associations.

Market Size

Zambia is a critical player in the global copper market, which is seeing increased demand due to electrification and green energy initiatives. While the majority of these tailings are no longer operational, and therefore not increasing in size, they remain an environmental concern. From research, the below is the size of the tailings which includes overburden, waste rock, and tailings. **The data needs to be verified.**

Overburden: Near-surface soils and rock from open pit stripping operations. Has approximately 32 overburden dumps in Zambia's mining industry and contain approximately 1,899 Million Tonnes of overburden, covering an area of approximately 206,465ha.

Waste rock: generated in underground shaft mining. Has approximately 21 waste rock dumps and approximately 77 Million Tonnes of waste rock and cover an area of approximately 388 ha.

Tailings: waste materials produced from concentration of copper-to-copper concentrates with copper content of less than 1%. Has approximately 45 dumps/dams and contain approximately 791 Million Tonnes of tailings and cover an area of approximately 9,125ha.

Zambian tailings has grades ranging from 0.3% to 1% copper grade. Mopani slag has 13 million tonnes estimated to contain 89 000 tonnes of copper and 44 000 tonnes of cobalt.

Supporting Infrastructure

The project benefits from established infrastructure, including power supply, skilled labor, accessible roads, and logistics networks, making it well-positioned to capitalize on the growing copper market.

Power: Access to Zambia's electrical grid and potential renewable energy sources.

Labour: A ready workforce for both skilled and unskilled labor, supported by local training programs.

Transportation: Utilization of Zambia's road network and its strategic location for exporting to neighboring countries.

2. Required Investment(s) and Deal Structure

The deal structure may involve debt financing, equity investment, or a joint venture, tailored to match investor preferences and project requirements. An estimated capital of \$6.5 million for a 50,000 tonnes per month copper processing module highlights the project's scalability and potential for expansion based on Jubilee's retreatment project. An example of a deal structure is that of Jubilee Metals Group who have formed a strategic partnership with Abu Dhabi-based International Resources Holdings (IRH) to recover copper from a historic waste dump in Zambia. This innovative partnership is underpinned by a new waste rock deposit holding at minimum of 260Mt material. This targets a roll-out of Jubilee's modular plants capable of reaching in excess of 25 000t per annum of copper under the JV.

3. Estimated Returns (Business Case)

It must be stated that copper tailings from each dam must be investigated because copper tailings from different sources could contain different properties leading to varying outputs in terms of compressive strengths and other concrete properties. Using Jubilee's Sable Refinery project 'it is projected to produce A-grade copper cathode from tails at an operating margin in excess of 35% at current prices. This endeavor is set to more than double Jubilee's current earnings profile, reflecting the high potential for profitability.

4. Social Impact

The project will have a profound social impact by creating jobs, fostering local economic growth, and mitigating environmental hazards associated with mine waste. The process of retreating surface tailings and extracting metals from mined ore is highly reliant on water as water is used to transport material over large distances and for processing. Reprocessing mine waste materials leads to the creation of sustainable solutions for resource utilization and improved process efficiencies which is critical in circular economy practices.

5. Tax Incentives for Copper Beneficiation

The project will have a profound social impact by creating jobs, fostering local economic growth, and mitigating environmental hazards associated with mine waste.

6. Other Government Support

The project might require upgrades to infrastructure such as power transmission lines by ZAMECO, showcasing the potential for collaboration between the private sector and governmental entities to ensure the project's success.

Government incentives such as subsidies are crucial in leading the tailings retreatment thus embracing circular practices. Collaboration among stakeholders, enhanced and support from an R & D perspective to assist in characterisation of the tailings quality. In addition, access to a database with verification of the quantities, grades and ownership of these tailings. In addition, a clear policy on how to access these opportunities. Delays in the approval by authorities of various assets need to be addressed.

7. Estimated Timelines

Detailed timelines for feasibility studies, construction, and commissioning can only be developed as the project progresses. But approximately 36-48 months from concept through to BFS stage

Investment Opportunity n.3: Establish Regional Scrap Collection & Reprocessing Centre in Zambia

1. Project Description

The global demand for copper is expected to nearly double from 25 million metric tons today to about 50 million metric tons by 2035, driven by technologies essential for achieving net-zero goals by 2050. Zambia, being the world's 7th-largest copper producer, is at the forefront of this surge. However, with less than 5% of its copper consumption domestic, there is a significant opportunity for Zambia to enhance its value addition, especially through recycling and reprocessing, which is projected to outgrow primary supply growth by 2050.

On average, 26.7 million tonnes of copper were used globally (2009 - 2018); 32 percent of this was sourced through recycling. Currently, a total of around 8.7 million tonnes of copper per year come from the recycling of "old" scrap (copper contained in end-of-life products) and "new" scrap (generated during production and downstream manufacturing processes). Copper is 100% Recyclable unlike most other materials, it can be perpetually recycled without loss of performance or qualities. In addition to its environmental benefits, the recycling of complex copper scrap, such as electronic waste, drives the recovery of many other metals such as gold, silver, nickel, tin, lead and zinc.

2. The Opportunity & Business Model

Establish a Regional Scrap Collection & Reprocessing Centre focused on copper and possibly other metals. This centre would capitalize on the high recycling efficiency of copper, which can be recycled repeatedly without performance loss, and the growing market for recycled copper due to environmental and supply chain concerns. The model would involve collecting scrap metal, reprocessing it into valuable products, and supplying these to both local and international markets. This initiative could serve as a hub for Southern Africa, leveraging Zambia's strategic position and existing copper mining infrastructure. There are potential opportunities for processing scrap metal into finished products.

Market Size

The Southern African region, including Zambia, the Democratic Republic of Congo (DRC), and South Africa, is pivotal in the global copper supply chain. Zambia alone accounts for a significant share of global copper production with an opportunity to further leverage its position through recycling and reprocessing. Approximately half a million thousand tons of scrap metal is available annually with an estimated value of about US\$6-\$15million. Hitachi Construction Machinery Zambia (HCMZ) has implemented a circular business model, and established a parts remanufacturing facility in Lusaka to simplify equipment repairs, especially for the mines in Zambia. This has resulted in faster machinery turnaround times thereby maintaining customer productivity reducing lifecycle costs. This CE approach achieved great value than the conventional resource recycling and reuse economy. The remanufactured parts contribute to the reduction of environmental impact by significantly reducing industrial waste as used parts are used as raw materials for new parts.

To understand fully the business case and scrap opportunities further research to validate, and expand the business opportunities, build strategic partnerships to access symbiotic relationships and mobilise financial sources.

Supporting Infrastructure

Power: Adequate and reliable power supply is crucial. Investment in renewable energy sources could complement this requirement.

Labour: Skilled and semi-skilled labour is essential for operations. Training programs could be established to enhance local expertise. Capacity building skills for circular economy specifically for scap processing and have innovative financing structures for this opportunity

Roads & Logistics: Improvements in road infrastructure and logistics capabilities are necessary to facilitate the efficient transport of scrap and finished products.

Technology: Advanced technology for recycling and reprocessing needs to be installed, requiring significant capital investment. Anticipated benefits from infrastructure investment include adoption of innovative technologies for processing equipment, increases in materials for manufacturers, and economic benefits and job creation from expanding recycling capacity, particularly in underserved and rural communities. A developing recycling industry is driving more circular practices, which combined with stronger enforcement of legislation and improved service provision by local municipalities, along with improvements in circular design processes, and private sector development of new business opportunities has potential to capture significant resources and close material loops.

2. Required Investment(s) and Deal Structure

The establishment of the centre would require substantial investment in infrastructure, technology, and workforce training. Initial estimates suggest an investment in the range of tens to hundreds of millions of dollars, depending on the scale and technology level. The deal structure could vary, involving a mix of debt financing, equity investment, and possibly public-private partnerships (PPPs) to spread the risk and capitalize on government incentives. **Partnerships across businesses can help** to stimulate the establishment. Private financiers including incubators, impact investors and private equity firms could help develop innovative financing mechanisms to encourage circular start-ups or existing companies to shift towards more circular practices

3. Estimated Returns (Business Case)

The return on investment (ROI) could be highly attractive, given the rising global demand for copper and the premium on recycled materials due to their lower environmental footprint. Detailed financial models would be necessary to provide specific ROI estimates, considering variable factors such as copper price fluctuations, operational costs, and the evolving regulatory environment.

4. Social Impact

The project could have a profound social impact by creating jobs, both directly and indirectly, through the development of a recycling ecosystem. It would also contribute to environmental sustainability by reducing the need for new copper mining projects, thus conserving natural resources and reducing carbon emissions.

5. Tax Incentives for Copper Beneficiation

Zambia and other Southern African countries may offer tax incentives for investments in copper beneficiation and recycling, aiming to add more value locally and boost industrial development. Specific incentives would need to be negotiated with governments.

6. Other Government Support

Government support might be necessary for upgrading electrical and transportation infrastructure. Additionally, regulatory frameworks supportive of recycling and sustainability could be crucial. Develop enabling regulatory framework for circular economy. There is need to develop a national strategy and action plan for the circular economy in mining.

7. Estimated Timelines

The project timeline from feasibility studies to operational start could span 3-5 years, considering the need for detailed planning, securing financing, infrastructure development, and obtaining necessary permits and approvals.

Investment Opportunity n.4: New Anode Slimes Refinery

1. Project Description

Since the 1990's, valuable anode slimes generated in copper smelting and refining at Zambia's smelters have been exported. In recent years, these valuable byproducts have been primarily sent to South Africa (~ 70%), with lesser amounts transported to India, China and other countries, where recovery and sale of the precious metals and other strategic minerals contained in the anode slimes takes place.

The Opportunity & Business Model

Anode "slimes" (sludge) are a by-product of the electrolysis process where pure copper is deposited on cathode plates, and soluble impurities accumulate on the bottom of the refining cells. The material is traditionally recovered from the cells, dried, and processed in a metals by-product plant (anode slimes refinery).

Based on the metallurgy of the concentrates that have been smelted, anode slimes can contain recoverable amounts of precious metals (gold, silver, platinum and palladium), lead, antimony, selenium, bismuth, tellurium and arsenic; the contained minerals and grades vary with the composition of the mine concentrates being processed at the smelter.

An anode slimes treatment plant operated in Ndola into the 1990s (the plant reportedly recovered gold, silver and selenium). There is little information available regarding this facility - likely, the anode slimes refinery plant suffered from the same lack of investments as the mines and smelters did during the nationalization period, and by the 1990's, it was not economic to modernize the historic plant or build a new one based on Zambia's copper production levels at the time (250,000 Mt in the year 2000).

In-country processing of the anode slimes would allow the mines and smelters to extract the final value out of the copper ores mined and processed, while generating additional local employment and revenues.

Market Size

An estimated 2kg to 20kg of anode slimes are produced per tonne of cathode copper.

Within Zambia, the current cathode copper production from smelters is approximately 300,000 - 350,000 tonnes, implying a potential supply of anode slimes of 3,000 - 3,500 Mt, assuming 10kg of slimes produced per tonne of copper cathode produced at the smelters (based on processing flow sheets and operating efficiencies, individual smelters may recover more or less anode slimes).

Significant potential future growth exists based on progress towards the New Dawn Government's goal of increasing copper production to 3 MM Mt/year in parallel with reducing anode production / increasing cathode production at existing smelters.

Supporting Infrastructure

A stable supply of electrical power is a critical requirement. Due to the relatively small tonnages being processed, other infrastructure components, such as labour, water, roads & logistics, are not viewed as critical factors.

2. Required Investment(s) and Deal Structure

The estimated capital cost for a greenfields 5,000 Mt/year anode slimes refinery is estimated to be on the order of €** to €** million.

Due to the modest tonnages of anode slimes generated by individual smelters, we believe that a new anode slimes refinery should have a single owner-operator that offers refining services to Zambian copper smelters on a tolling basis.

Ownership of such a venture could take many forms, including a partnership between some or all of the domestic smelters, or a new business owned, operated and managed by ZCCM-IH. Financing would likely be a mix of debt and equity, perhaps combined with offtake agreements with EU manufacturing and commodity trading interests

3. Estimated Returns (Business Case)

TBD - for a greenfields refinery, the ROI will depend on many factors, including the average metal content of the anode slimes, long-term commodity prices, as well as capital and operating costs for the new refinery.

4. Social Impact

Construction of a new anode slimes refinery could potentially create several hundred temporary jobs during the site preparation and building phases, representing a mix of skilled trade and general labor positions. Once in operation, employment at the refinery would be nominal (perhaps on the order of 100 - 150 positions) but offering a mix of stable work in management, finance, technical and general laborer positions.

Potential ESG impacts would include particulate emissions from processing and refining the anode slimes, along with a need for environmentally-safe management of waste products (post-processed slimes) and treatment of water used within the refinery.

For the Zambian government, benefits would include collection of personal and corporate income taxes from the refinery and its staff, as well as additional income taxes and increased production royalties paid by the smelters producing the slimes.

5. Tax Incentives for Copper Beneficiation

The ideal location for a new anode slimes refinery, in terms of financial incentives and infrastructure, would either be in the Copperbelt (Kitwe or Ndola), or at a new or existing Special Economic Zone.

6. Other Government Support

Government intervention in terms of policies and regulations would likely be required prior to investment.

From the policy side, consideration should be given to amending the Mines and Minerals Development Act to require processing of anode slimes in country - this might be accomplished by adding a TBD export duty on the slimes equal to the estimated lost revenues on material shipped out of Zambia.

Targeted incentives may be necessary to encourage the tolling model (as was done in Madagascar regarding cobalt powder).

7. Estimated Timelines

For a greenfields anode slimes refinery, estimated timeframes following completion of corporate set-up and initial financing are likely on the order of:

Market Study / Preliminary Economic Assessment	6+ months
Feasibility Study (include site location)	1+ year
Design, Financing, Permitting, Procurement, Construction	2+ years
Phased startup to reach Commercial Production	6+ months

Investment Opportunity n.5: Installing Continuous

Cast Wire Rod Mill at Existing Smelter(s)

1. Project Description

There is generally a horizontal divide between the copper producers (those engaged in mining and/or smelting and refining copper) and the industries downstream of the production of the basic internationally traded pure copper metal form - the copper cathode. Wire rod is an exception, being made by some copper refiners, and by wire and cable manufactures, primarily for their own internal use.

For refiners, it is relatively easy to add a wire rod mill adjacent to the refinery in order to capture more added value to the cathode and to benefit from economies of scale. It should also be noted that several copper producers are increasingly crossing the upstream/downstream divide, and have a vertically integrated approach.

The Opportunity & Business Model

Copper wire rod (cast or rolled) enjoys strong demand worldwide as the starting product for value-added downstream manufacturing of goods and materials for the electrical power (wire and cable, connectors, etc.), electronics (cables, connectors, plugs and switching circuits for appliances and entertainment electronics) and transportation (wiring harnesses, electric motors, computers, etc.) industries. Together, power networks, electronics and transportation applications account for an estimated 70% of the total global demand for copper wire rod.

Within Zambia, Neelkanth and ZAMEFA convert locally-sourced copper cathodes into copper wire rod as an input in copper wire and cable manufacturing, as well as exports into regional markets.

Depending on the type of melting furnace (shaft, induction, etc.), various melting rates can be achieved on an hourly or daily basis to achieve the targeted production levels of copper rods of varying diameters (such as 8mm, 12.7mm, 15.6 and 19mm diameter rods). Off-the-shelf furnace technology can be adapted to use both copper cathodes and copper scrap as feedstock. Production levels can be scaled / sized as necessary - ranging from 30 to 250+ Mt/day.

Three of Zambia's copper smelters and refineries produce LME Grade A copper cathodes: Chambishi Metals, Mopani Copper Mines, and Konkola Copper Mines. A fourth smelter, operated by First Quantum Minerals, processes copper concentrates produced at the company's Kansanshi and Sentinel mines in the North West Province, but produces only copper anodes.

Mopani Copper Mines has studied this idea internally, and would be a logical partner. Rod production, in turn, could be used for further value-added manufacturing in country, regionally, or exported to the EU.

Supporting Infrastructure

Beyond additional electric power demands, no significant infrastructure investments are anticipated.

2. Required Investment(s) and Deal Structure

Financing options and potential deal structures will be driven by the production capacity and capital costs of the rod mill selected by individual smelters. Lower production levels (< 100 Mt/day) might be financed internally; higher production levels could require debt or offtake financing.

EU wire / cable manufacturers (or other EU end users) might consider partnering with one of Zambia's operating copper smelting and refining complexes (in the case of the Kansanshi smelter, a refinery would be an additional required investment), and add a continuous-cast rod mill to directly convert cathode copper to wire rod, and use this feed material to produce copper wire and cable products in Zambia or the EU, or alternatively, sell the value-added products regionally or globally in response to growing demand for wire and cable. A related opportunity would be to add production lines to convert cathode copper to cakes or billets for sale to brass mills.

Opportunities for upgrading copper cathodes into billets and cakes for the production of strips, bars and tubes that would be produced by rolling and drawing is another option.

Unlike copper wire, these products are not standardized, and can have a wide range of dimensions and chemical compositions, and would lend themselves to smaller, less capital-intensive investments.

3. Estimated Returns (Business Case)

Potentially, upgrading LME Grade A cathode to rod could allow smelters to realize an additional €*** to €*** / Mt over prevailing LME prices.

For high cost, legacy copper producers, the additional revenues could significantly increase operating margins and profitability.

4. Social Impact

New rod mills would require additional workers of varying skill levels who would likely be hired locally; significant training in the initial months of operations would also be necessary.

Demands on the local power and utility grids would increase, and the price and availability of continuous power supplies could be a key determining factor in the economics of operating continuous cast mills.

No significant ESG issues are anticipated with construction and operation of continuous cast rod mills.

5. Tax Incentives for Copper Beneficiation

The added value created by transforming copper cathodes to copper wire rod should preclude the need for any government financial interventions or policy actions.

The best value-enhancement for all concerned parties might be investments in road and rail infrastructure and streamlined inspections at border crossings in order to facilitate faster, more cost-effective transportation of cathodes and rods to seaports and regional markets.

7. Estimated Timelines

The estimated timeframes for adding a continuous cast rod mill to an existing smelting and refining complex refinery are likely on the order of:

Market study / preliminary technical & economic assessment	6+ months
Feasibility study and design	1+ year
Financing, permitting, procurement, construction	1 - 2 years
Phased startup to reach Commercial Production	6+ months

Investment Opportunity n.6: Fully-Integrated

Smelting & Refining Industrial System

1. Project Description

As a long-term strategic move, southern and eastern African nations should consider establishing one or more regional mining and downstream processing and fabrication hubs, designed around the concept of regenerative industrial systems, and re-shoring such downstream beneficiation from other regions, principally Asia / China.

A new copper mining and processing / downstream fabrication hub in Zambia (located in existing or new Special Economic Zones) could benefit key regional economies (Botswana, DRC, RSA, etc.), and serve as a counterweight to China's dominance of downstream processing and value-added manufacturing.

The Opportunity & Business Model

Both EU and RSA copper manufacturers and fabricators have established domestic / regional markets, technology, skilled labour forces and access to finance, but are finding access to raw materials (copper cathode) becoming an increasing issue of concern (for EU manufacturers, supply chain issues and access to cathode; for RSA businesses, the rapid depletion of the country's primary copper mine, Palabora, where economic ore reserves will likely be depleted by the early 2030's).

Future partnerships between EU and RSA manufacturers would have an added benefit of being able to sell into EU, BRICS, COMESA and SADC markets.

Operating out of such a hub, Zambian and EU manufacturers could effectively serve both the southern Africa regional markets and possibly many other African and Middle Eastern markets as well. While the overall market size would be modest, Zambia's location, supplies of cathode copper, and lack of competition in SADC and COMESA could be very advantageous.

Inclusion of the DRC (cobalt) and Zimbabwe (lithium) in such a venture might allow participants the opportunity to realize the economies of scale and certainty of supplies to support EV battery production.

Supporting Infrastructure

Anticipated greenfields location - would require complete infrastructure development (power, water, telecommunications), likely including a new townsite with housing, schools, commercial facilities, etc.

2. Required Investment(s) and Deal Structure

Building a major greenfields copper smelter and refinery (est'd 300 - 500,000 Mt/year), along with infrastructure to support value-added manufacturing of the copper produced at the smelter, would likely require a multi-billion Euro capital investment.

In the current elevated interest rate environment, a Public-Private Partnership might be a viable investment model, bringing together a range of private sector mining and manufacturing interests.

5. Tax Incentives for Copper Beneficiation

Fiscal incentives typical of those offered in other Special Economic Zones may be required to incentivize investment in the copper processing and downstream manufacturing areas.

Government contributions might be in the area of providing infrastructure if the complex is located in a new or existing Special Economic Zone.

6. Other Government Support

Additional government support would likely be required, based on the findings and recommendations of the studies outlined in Section 7.

7. Estimated Timelines

Due to the anticipated magnitude of the investment and the need to fully-understand the economics and geopolitical environment, and assess the long-term supply of copper concentrates from existing and future mines in Zambia and surrounding countries, a staged, multi-year study, assessment and evaluation period is recommended.

Potential timeframes are likely on the order of:

Detailed Market Assessments	12 - 18 months
If findings are positive,	
Preliminary Economic Assessment / Pre-Feasibility Study	12 - 18 months
Feasibility Study (include design & site location)	2 - 3 years
Financing, Permitting, Procurement, Construction	3 - 5 years

Investment Opportunity n.7: Increased Production of Copper Cathodes

1. Project Description

Prior to 2015, almost all of the copper concentrates produced in Zambia were smelted, refined and exported in the form of copper cathode. Since that time, increasing amounts of copper (over 300,000 Mt/year) is exported as blister or anode, with value-added refining taking place in other countries.

With an estimated 900,000 to 1,000,000 Mt of refinery capacity in place at the Mopani, Konkola and Chambishi smelters (Kansanshi only produces blister and anode), there is an opportunity to rapidly increase cathode production and exports at nominal costs (primarily refurbishment). Benefits to mining companies would include collecting Cathode Premiums (US\$182/Mt in 2023), and for the Government, potentially-increased corporate income tax revenues.

The Opportunity & Business Model

With global copper markets currently in a tight supply-demand balance, and projections for a supply gap of several million tonnes to develop over the next several years, mining companies can readily sell every tonne of copper they produced. Zambia's three integrated smelting and refining complexes have the added benefit of LME Grade A quality certifications on their production, which allows mining companies to receive significant Cathode Premiums on every tonne of cathode sold.

With significant idled capacity, there is an opportunity to rapidly scale back up cathode production at relatively nominal capital costs for refurbishment – modernizations and upgrades to reduce emissions could result in additional time and costs.

Availability of sustained electrical power at competitive prices may be a limiting factor. Geopolitical factors may also be involved in decisions to export blister and anode for final processing and refining in the home countries of the mine owners.

Market Size

As documented in a recent Market Assessment, domestic consumption of copper cathode is on the order of 20,000 Mt compared to estimated refined production of about 350,000 Mt and total Zambian mine production of about 800,000 Mt (over 20 million tonnes worldwide).

With LME Grade A certifications, Zambian cathode production can be sold and delivered worldwide. Significant amounts of Zambian cathode have historically been delivered to European and Asian markets.

Supporting Infrastructure

The primary requirement for increased cathode production will be stable power supplies at competitive prices. Improving transportation logistics (particularly reduced border crossing times) would also be welcomed by smelters / exporters.

2. Required Investment(s) and Deal Structure

Investments in refurbishing existing idled capacity are believed to be nominal (E10-E25 million) and likely could be funded out of working capital. Alternatively, a creative deal structure might be developed, say, between an EU wire or EV manufacturer, who might invest the necessary capital in exchange for guaranteed long-term supply at a to-be-negotiated price.

At Mopani, the existing Glencore life-of-mine offtake and marketing agreements could pose additional issues depending on the final deal structure agreed to between ZCCM-IH and UAE investors.

3. Estimated Returns (Business Case)

For the mining companies, the main benefit will be the opportunity to collect Cathode Premiums on each additional tonne of cathode copper sold. For the deep, underground legacy mines in the Copperbelt with traditionally high operating costs (4th quartile), additional per unit revenues could have a significant impact on

both current operating margins and future capital investments to develop new ore zones and increase production.

Domestic smelters will realize increased revenues from treatment and refining charges associated with transforming blister and anode into cathode (funds that are currently realized by smelters and refineries outside of Zambia).

4. Social Impact

Increased refined (cathode) copper production is not likely to require significant numbers of new workers, and as a result, local economic multiplier effects are likely to be nominal.

Boosting refined output will require additional electricity and water, along with increased per unit emissions associated with the refining process.

For the Zambian government, the primary impact will be in potentially increased Corporate Income Taxes on the additional income realized by mining companies from Cathode Premiums on the higher production levels.

6. Other Government Support

Potential areas of government support would include engaging with ZAMECO on upgrades to the grid to ensure stable power supplies.

Consideration might also be given to fiscal policy measures to encourage and support increase cathode production - possibly something along the lines of a reduced production royalty on copper refined and exported in the form of cathode (versus blister or anode).

7. Estimated Timelines

Technical assessment of existing smelter and refinery	6 months
Financing and procurement	6 months
Refurbishment / modernization (as required) (including any required permitting)	6 - 18 months

Investment Opportunity n.8: Increase Rod Production, Expand Product Lines at Existing Wire & Cable Operations

1. Project Description

Zambia is currently ranked as the 9th-largest copper producer in the world producing around 800,000MT in 2022. However, Zambia consumes only a small amount of the copper cathode it produces each year, exporting over 95%. It is estimated that over 350,000 Mt of cathode is produced, of which 335,000 Mt is exported. Zambia's copper is mainly exported as cathode or blister, the standard forms of the internationally traded commodity.

Zambia only adds value to about 4% of its annual refined copper output (350,000 tonnes/year - of which approximately 15,000 Mt are used in downstream manufacturing) to make fabricated products, while at the same time, importing finished goods containing copper. It is therefore logical and a matter of urgency that Zambia attracts investments in this sector thereby expanding production for existing companies and new investors.

2. The Opportunity & Business Model

Zambia has considerable unutilized refining capacity, and the capacity in place to produce up to 1.2 million Mt of cathode annually, which could be unlocked if the argument for increased production of semis in Zambia were strong.

The existing copper rod, wire and cable producers, ZAMEFA and Neelkanth, are both operating at approximately 50% or less of design capacity, and combined, are producing approximately the same amount of wire and cable that ZAMEFA produced more than a decade ago before Neelkanth entered the market. Both companies could benefit from increasing production of existing products and development of new products – either independently, or in association with an EU manufacturer or investor.

There is a clear case for Investment opportunities in new wire and cable products by partnering with Neelkanth and/or ZAMEFA using some of the operating capacity, and tackling new markets, e.g., in Africa or the EU.

Beyond rod, wire and cable manufacturing, value-added copper manufacturing in Zambia remains quite limited. Elswedey Electric produces electrical transformers and substations, while Non-Ferrous Metals Works (Zambia) operates in the foundry, casting and machining niche, with a strong focus on products for the mining industry. Zambia has other small copper and alloy foundries, largely to support the mines (World Bank, 2011), that use mostly imported scrap and alloys, since supplies in Zambia are limited.

3. Market Size

The country has not been able to significantly expand value-addition to downstream copper activities. The two principal copper fabricators, Metal Fabricators of Zambia (ZAMEFA) and Neelkanth Cables, purchase only approximately 15,000 Mt of copper cathode to produce copper rod, wires and cable products for domestic use and export to regional markets where the companies benefit from market proximity. This quantity has remained static for the past 10+ years. Both Neelkanth and ZAMEFA operate at 50% or less of design capacity. They have a strong reliance on government tenders, principally related to electrification.

The Southern and East Africa regions remain the primary export markets for Zambia's copper rod, wire and cable manufacturers, where they sell in strong competition from South African (and Asian) producers. In contrast to Zambia, South Africa has had a small but competitive copper cluster, centred primarily on pipes (but not fittings) and cable. South African production of copper products is estimated at roughly four times the size of Zambia's downstream copper manufacturing sector. In 2019, South Africa had almost 60 medium-sized and large cable producers employing over 10,000 workers; about 50 manufacturers of pumps, valves, and related equipment, which used a variety of metals including copper and copper alloys; and over 80 foundries using 14,000 tonnes of copper. Competing against these established producers has proved difficult for the two smaller Zambian firms, who collectively employ about 500 people. Growing adoption of Local Content Laws has also reduced opportunities for exports of Zambian value-added wire and cable products.

With a combined design capacity 50,000MT, local manufacturers in 2023 produced about 15,000MT of Copper rod, of which about 8,500MT was exported 6,500 converted to wire and cable which was predominately sold in the local market and a good portion exported to neighbouring countries. In the near to mid run, electrification, the introduction of green technologies, and growth in manufacturing of machinery and equipment are expected to boost copper wire, cable, and rod demand in Zambia and across the southern Africa region.

4. Supporting Infrastructure

Downstream, copper fabrication in Zambia has faced a variety of constraints, and infrastructure shortcomings add to the challenges of manufacturing in Zambia. These include, electricity, transportation, border delays among others.

Electricity service is often unreliable, and a policy of moving towards cost-reflective prices has led to higher costs. Extrusion processes require stable, quality electricity supplies; unanticipated interruptions can damage both the equipment and the product. The commodity boom brought a rapid increase in electricity demand in central Africa; its end brought constraints to government finances and borrowing. Both of these trends have made it harder to maintain the national electricity system.

In addition, 95 per cent of Zambian transport was by road in 2018. Poor maintenance of the roads, which have been damaged by overweight freight, and long delays at borders add to the cost of exports. In theory, bulk exports like copper semis and cable would be cheaper (and more environmentally friendly) by rail, and the government aims to increase the share of rail to 30 percent. The new (to be developed) Lobito rail corridor or investments (soft and hard) into Global Gateway strategic corridor may address some of Zambia's transportation infrastructure issues. It offers an opportunity for Zambia to ramp up its production of copper wire and other value-added copper products to target the region.

5. Required Investment(s) and Deal Structure

For existing companies there are only nominal capital costs for a joint venture manufacturing agreement unless new products required updated equipment and facilities. For a new plant producing about 10,000MT/Year of rod, wire and cable, approximately \$10 million to \$15 million initial investment would be required.

6. Estimated Returns (Business Case)

For the manufacturing companies, the main benefit will be the opportunity to add value and increase earning from each tonne of copper produced and sold. Increasing rod tonnages lowers operating costs and therefore additional per unit revenues could have a significant impact on both current operating margins and future capital investments to develop new products and increase production.

However, accurate measure of returns depend on a lot of factors that may include, demand, cost capital, inputs, and duration of investment and time for operationalization.

7. Social Impact

Increased rod, wire and cable production is likely to require significant numbers of new workers, and as a result, local economic multiplier effects are immeasurable. However, boosting output will require additional electricity and water, along with increased charcoal usage associated with the casting process of cathode.

For the Zambian government, the primary impact will be in potentially increased Corporate Income and Value Added Taxes on the higher production levels. Being a net exporter sector for copper rod, Government will realise increased foreign exchange earnings.

For new investors – multiple benefits, including trained workforce, established sources of cathode supply, existing domestic and regional markets for products.

8. Tax Incentives for Copper Beneficiation

Currently all entities involved in value addition of copper enjoy a reduced CIT of 15%, duty draw back refunds on all exports, on top of the general incentives for manufacturing as outlined in the ZDA Act.

9. Other Government Support

More consistent and co-ordinated government support, especially to reduce the cost of copper metal inputs, improve infrastructure, invest in high-level skills, and ensure more efficient tax systems would also be needed.

None of the companies receives any price discounts from the mines for the high-quality LME Grade A copper cathode they purchase (the ideal input for copper fabrication), except for transportation costs. They pay the same price as every other company they compete with: LME plus cathode premium. It is therefore imperative that this is addressed to ensure competitiveness of the local companies.

10. Estimated Timelines

This only applies to greenfield investments:

Technical assessment and feasibility study	6 months
Financing and procurement	6 months
Construction of Plant	12 – 18 months



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