Assessing Labor Abuses in the Copper and Cobalt Supply Chain in Zambia

Report

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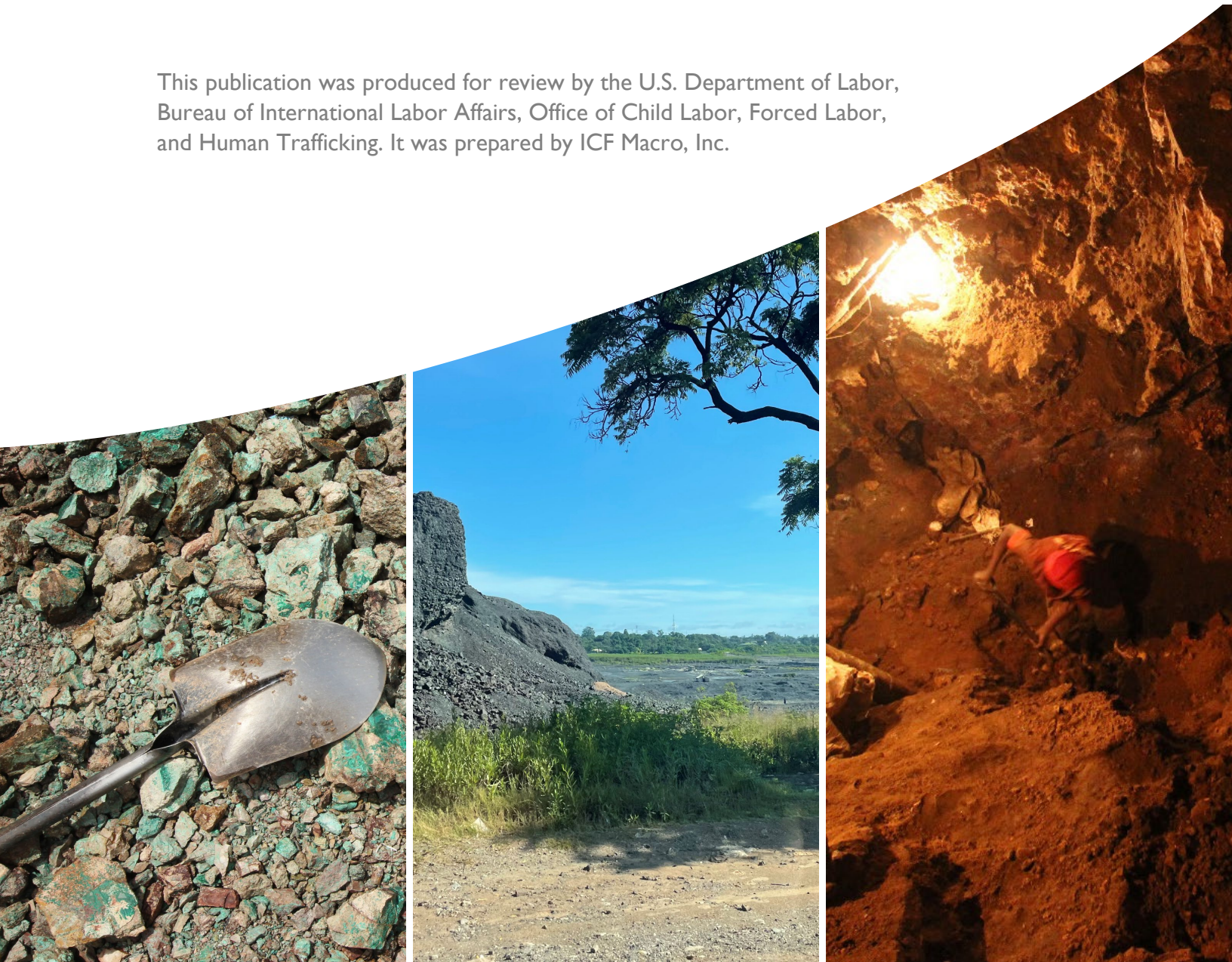

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This report presents research on child labor in the copper and cobalt industry in Zambia. ICF Macro, Inc., prepared this report according to the terms specified in its contract with the U.S. Department of Labor. The research team would like to express sincere thanks to all the parties involved for their support and valuable contributions.

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This study was prepared by ICF and its in-country consultants.

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CONTENTS

ABBREVIATIONS

ASM	artisanal and small-scale mining
DRC	Democratic Republic of the Congo
GDP	gross domestic product
ILO	International Labor Organization
KCM	Konkola Copper Mines
KII	key informant interview
LSM	large-scale mining
NGO	non-governmental organization
PPE	personal protective equipment

EXECUTIVE SUMMARY

INTRODUCTION AND METHODOLOGY

This report presents findings from a study on child labor in the copper and cobalt industry in Zambia. The copper and cobalt sector plays a pivotal role in Zambia's economy, contributing significantly to its gross domestic product, export earnings, and tax revenue. Despite government efforts to formalize mining activities and enforce regulatory frameworks, reports have highlighted persistent child labor issues in the informal mining sector.

The study had two main objectives: first, to map the domestic supply chains of copper and cobalt within the area where working children were sampled, and look at connections to further downstream goods, and second, to identify the potential presence and job characteristics of those who experience child labor in the supply chain.

The methodology combined secondary data analysis, a quantitative workers' survey, qualitative worker interviews, and key informant interviews. The research team conducted a scoping visit in March 2024 involving interviews with representatives from industry, government, unions, and civil society. The survey included 147 child workers aged 12–17 from Copperbelt and North-Western Provinces. Qualitative interviews were conducted with 14 children and 16 adults. In addition, 24 key informant interviews were conducted with respondents from civil society, government, and industry to understand the copper and cobalt supply chain structure.

The study faced several limitations and challenges. The use of purposive and convenience sampling means that the findings are not statistically representative. The sampling method may have excluded workers whose employers restrict their movements or communication. Due to safety concerns, researchers were limited in their questions on forced child labor and the role of gangs. The complexity of the cobalt and copper supply chains, including the introduction of informal materials, complicates tracing and determining the true destination of exports.

KEY FINDINGS

Child Labor in Copper and Cobalt Production

The study confirms the presence of child labor in Zambia's copper and cobalt mining sector. Key findings include the following:

- **Presence of child labor:** All 147 child workers who participated in the survey met the conditions to be considered in child labor according to international standards, primarily due to their engagement in hazardous work.
- **Demographics:** The sample included more older adolescents (48% aged 16–17) than younger adolescents (16% aged 12–13) and was predominantly male (93%).
- **Education impact:** A total of 60% of survey respondents did not attend school in the week prior to the survey. School attendance rates declined with age, with only 30% of 16–17-year-olds attending school. Many respondents had fallen behind in their education, with respondents having completed a highest grade 2.7 years behind the appropriate grade for their age, on average.
- **Entry into work:** Children entered mining work through various pathways, including introduction by friends, family members, or other adults. Financial need was the primary driver,

with many citing school-related costs, basic necessities, or family support as motivations for working.

- **Work activities and minerals mined:** The most common activities performed by children were moving ore within or outside the mine (88%), digging for ore without machines (84%), and buying or selling ore (84%). Two-thirds worked at underground or pit mines, and 54% worked at dump sites. Almost all respondents (94%) reported mining copper, with fewer mining cobalt (18%).
- **Working hours:** Children worked long hours, with 12–14-year-olds averaging 40.4 hours per week and 15–17-year-olds averaging 47 hours per week. Those not attending school worked significantly more hours (51 hours per week) than those attending school (34.7 hours per week).
- **Hazardous conditions:** Children were exposed to numerous hazards, averaging 7.4 hazards each. The most common hazards included using sharp tools (90%), carrying heavy loads (86%), working amid dust or fumes (80%), and performing repetitive tasks (77%). Relatively few respondents used personal protective equipment. Two-thirds (67%) reported being injured on the job, with many requiring medical treatment.
- **Employment relationships and forced child labor:** A total of 80% of respondents worked under someone else's direction, and 40% reported being punished for mistakes at work. Qualitative interviewees described verbal abuse, threats, and physical violence. One-third of those working under someone else's direction reported that they would not be allowed to stop working if they wanted to quit. Qualitative data indicate that some children, including street children, are transported from cities to mining sites for work.

Supply Chain Mapping of Zambian Copper and Cobalt

The study reveals a complex supply chain ecosystem for copper and cobalt in Zambia, with significant implications for traceability and responsible sourcing. Key findings related to supply chain structure, material flows, export patterns, and traceability challenges include the following:

- **Production structure:** Large-scale mining is dominated by multinational corporations using sophisticated technology and mechanization, and artisanal and small-scale mining (ASM) operations employ labor-intensive methods with minimal equipment. Under Zambia's legal framework, artisanal mining is exclusively reserved for Zambian citizens, and small-scale mining may be undertaken by citizen-owned or citizen-influenced companies.
- **Supply chain co-mingling:** Multiple points were identified through which formally and informally produced materials become co-mingled, particularly through traders and middlemen, Chinese-owned processing facilities, and smelting operations. Licensed traders routinely purchase material from informal miners and then sell it into formal channels, effectively legitimizing copper from informal sources through the payment of mineral royalty taxes.
- **Copper exports:** Zambia exports approximately 90% of its copper production, with only about 10% used domestically. In 2023, nearly two-thirds of all Zambian exports of copper went to China and just over a quarter went to India. Although Zambia export records report Switzerland as the leading destination for Zambian copper exports (62.2% by value), import records from receiving countries reveal that China (61.3%) and India (27.7%) are the actual primary destinations. This discrepancy occurs because Swiss-based commodity traders arrange shipping and sell copper in transit, functioning as intermediaries rather than end users. Unrefined copper anodes account for the largest share of Zambia's copper-related exports by value (just over 75%), followed by refined but unwrought copper alloys (24.3%).

- **Cobalt exports:** Zambia also exports nearly all of its cobalt production, with nearly 98% of all cobalt-related exports going to South Africa in 2023. Almost all (97.7%) of Zambia's cobalt is exported in the form of cobalt oxides and hydroxides.
- **Traceability challenges:** The technical necessity of blending different copper concentrates at smelting facilities further complicates traceability, making it virtually impossible to determine the original source of minerals after they have been processed.

CONCLUSION AND RECOMMENDATIONS

The study provides compelling evidence of child labor in copper and cobalt mining in Copperbelt and North-Western Provinces. Findings indicate that child labor is widespread in the sector, particularly among older adolescents. Younger children and adolescents are exposed to significant hazards in their work, and injuries are common. There is also evidence of forced child labor. One-third of survey respondents who worked under the direction of someone else reported that their employers would not allow them to stop working if they wanted to. Qualitative data revealed instances of children being coerced into work through verbal abuse and physical violence. One child, who was transported to another city for work and housed by their employer, faced threats of being fired without receiving money to return home and of being denied food. The presence of child labor in the extraction phase and the extensive co-mingling of materials in the supply chains suggests that all copper produced in Zambia—and the cobalt present as a byproduct of copper mining—carries a risk of child labor.

Recommendations to Improve Supply Chain Transparency and Reduce Child Labor

Recommendations for Private Sector Actors:

- **Implement robust due diligence systems.** These systems should go beyond first-tier suppliers to include all stages of the supply chain, focusing in particular on major co-mingling points identified in this report, such as licensed traders who purchase from informal sources, Chinese-owned processing facilities that accept material from multiple sources, and smelting operations that blend concentrates from different origins.
- **Support formalization of ASM operations** through financial and technical assistance programs that help miners obtain proper licensing, access financing, improve their operational practices, and establish direct sourcing relationships with formalized ASM operations to reduce reliance on traders and middlemen, where significant co-mingling occurs.
- **Conduct regular third-party audits** of suppliers and processing facilities, with special attention to high-risk points of co-mingling identified in the supply chain, such as Chinese-owned processing facilities.
- **Invest in community development programs** in mining areas, with a focus on education, alternative livelihoods, and social services that address the root causes of child labor.

Recommendations for the Government of Zambia:

- **Strengthen enforcement of the Minerals Regulation Commission Act** by increasing monitoring capacity for ASM operations and enhancing penalties for non-compliance with licensing requirements.
- **Regulate Chinese-owned processing facilities.** Strengthen oversight of the numerous Chinese-owned facilities throughout the Copperbelt that serve as key intermediaries between informal miners and formal markets, requiring them to implement stricter sourcing controls.
- **Reform the mineral trading permit system** to close loopholes that currently allow for the "laundering" of informally mined materials through tax payments, implementing stricter verification requirements for mineral origin.

- **Establish designated trading centers** for ASM copper and cobalt with standardized pricing, testing facilities, and transparent documentation, reducing the influence of informal traders.
- **Increase support for ASM formalization** by simplifying licensing procedures, reducing fees, providing technical training, and creating incentives for compliance.
- **Strengthen child labor monitoring systems** at mining sites, with regular inspections and coordination between mining and labor authorities to ensure enforcement of child labor prohibitions.
- **Improve tracking of school attendance** of children in communities near mining areas and provide resources or other incentives to families to keep children in school (e.g., small financial incentives funded by the proceeds of copper exports).
- **Introduce educational curriculum and awareness campaigns** about the dangers of child labor in mine work at schools and communities near mining sites.

Recommendations for Other Governments:

- **Expand technical assistance** to the Zambian government for implementing supply chain traceability systems and strengthening enforcement capacity for mining regulations. Provide funding and technical assistance to Zambian government or non-governmental organization efforts targeted toward addressing hazardous child labor, supporting accident prevention and response in ASM, and addressing educational barriers and supporting livelihood diversification in mining communities.
- **Focus trade enforcement of labor standard requirements on Swiss commodities traders.** Switzerland is the dominant commodity trader of copper exports from Zambia. Zambian export records indicate that Switzerland is the importer of record for 62% of copper export value. However, the vast majority of this copper is traded during shipment, and the actual physical destination markets for these exports are primarily China and India. Work with Swiss authorities to improve transparency and accountability for labor standards in commodities trading.
- **Support traceable material streams.** Fund pilot projects that establish verifiable chains of custody from mine to market, specifically addressing the technical challenges of maintaining separation through the three identified co-mingling points: licensed traders who purchase from informal sources and formalize material trade through tax payments, Chinese-owned processing facilities that accept and aggregate material from various sources, and smelting operations that blend concentrates from different origins for technical reasons. Incentivize responsible sourcing through preferential trade status for verified responsible suppliers and public recognition for companies implementing best practices.

Recommendations for Civil Society Organizations:

- **Partner with private sector actors** to design and implement community development initiatives in mining areas that create alternative livelihood opportunities and improve access to basic services.
- **Monitor key supply chain junctures.** Conduct independent monitoring operations, focusing in particular on the specific points at which formally and informally produced materials become co-mingled, identified in this report. Publish findings to enhance transparency and accountability in the sector.
- **Support community-based monitoring systems** that empower local stakeholders to identify and report child labor and other violations in mining operations.
- **Provide technical assistance to ASM operators** on formalization procedures, environmental management, safety practices, and regulatory compliance.

- **Advocate for policy reforms** that address structural issues in the mining sector, including fair pricing mechanisms, transparent revenue management, and equitable distribution of benefits from mineral extraction.

1 INTRODUCTION

The copper and cobalt sector in Zambia plays a pivotal role in the nation's economy, contributing significantly to its gross domestic product (GDP), export earnings, and tax revenue. However, the sector is not without its challenges. Civil society and media reports have highlighted the persistent issue of child labor in informal mining in Zambia. Despite government efforts to formalize mining activities and enforce regulatory frameworks, child labor remains a concern.

The purpose of this study is to explore the role of child labor in the sector. This study was intended to serve two main objectives: first, to map the domestic supply chains of copper and cobalt within the area where working children were sampled, and look at connections to further downstream goods, and second, to identify the potential presence and job characteristics of those who experience child labor in the supply chain.

This report consists of six sections. Section 1 introduces the context and objectives of the study, followed by background information on copper and cobalt production, processing, and labor conditions in Section 2. Section 3 provides a detailed account of the study's methodology and its limitations. Section 4 provides findings on the supply chain, and Section 5 provides findings on child labor. Section 6 provides a conclusion and policy recommendations intended to enhance supply chain transparency and reduce child labor.

2 BACKGROUND

2.1 ECONOMIC OVERVIEW

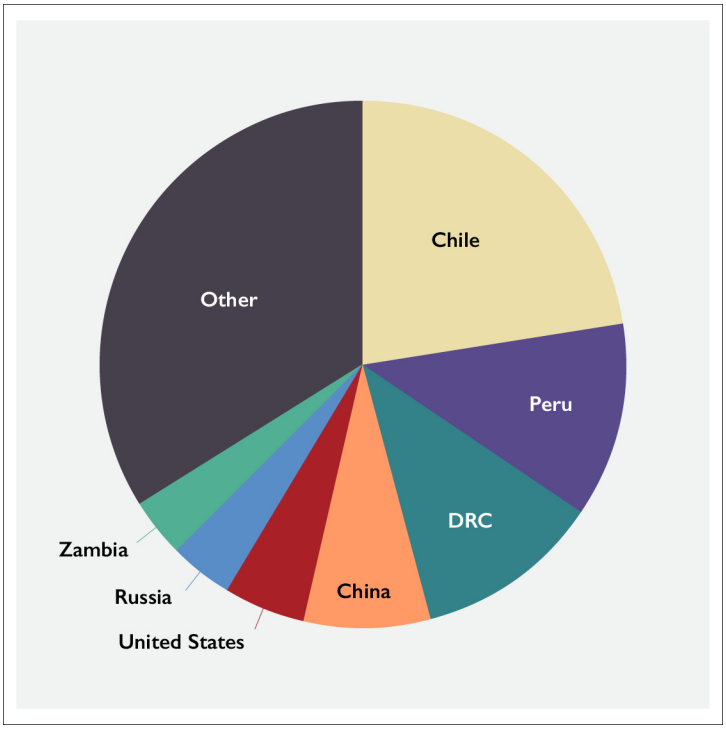
Zambia is a lower-middle-income country with a GDP of $19.98 billion USD and a GDP per capita of $1,330 USD in 2023 (World Bank Group, 2025). Two-thirds (64%) of the population lives in poverty on less than $1.90 per day (2022 data; The Global Economy, 2025). The labor force participation rate is 60%, and the unemployment rate is 6% (2023 data; The Global Economy, 2025). The service sector (including construction) accounted for approximately 57% of the GDP in 2023, whereas the industrial sector made up 35%, manufacturing 8%, and agriculture 2% (World Bank Group, 2025). The economy of Zambia is heavily dependent on exports (World Bank Group, 2024, 2025). Zambia's top three export partners in 2023 were Switzerland (27%), China (15%), and India (13%), with exports primarily consisting of copper, tobacco, flowers, and cotton (UN Comtrade, 2024). The Zambian economy has shown steady growth in recent years, growing by 5.2% in 2022 and 5.8% in 2023 (African Development Bank Group, 2024).

Despite a slight dip in cobalt prices in 2024, mining interest in Zambia remains strong due to growing global demand, an upward trend in copper prices, and various national reforms, although production is sensitive to market pricing (*Riskmap.Fairtrade.Net/Commodities/Cocoa*, n.d.; Williams, 2025). Copper and cobalt are the dominant minerals mined in Zambia, with smaller operations in emeralds, gold, and manganese. Zambia's mineral resources continue to attract significant foreign direct investment (World Bank Group, 2024). China is the largest foreign investor in Zambia's mining sector, and about 88% of Chinese investments in Zambia are in mining or related activities (Asada, 2023). Copper is Zambia's most important export commodity, with exports accounting for approximately 70% of the country's export earnings and contributing close to 30% of total tax revenue (Extractive Industries Transparency Initiative, 2023).

2.2 GLOBAL COPPER AND COBALT PRODUCTION

Global copper production in 2023 was 22.4 million metric tons, up slightly from 21.9 million metric tons in 2022 (International Copper Study Group, 2025). Chile has consistently ranked as the world's largest producer of copper. In 2023, Chile accounted for just under 23% of global production, followed by Peru (12%), the Democratic Republic of the Congo (DRC) (11%), and China (8%). Zambia accounted for just 3% (U.S. Geological Survey, 2025.

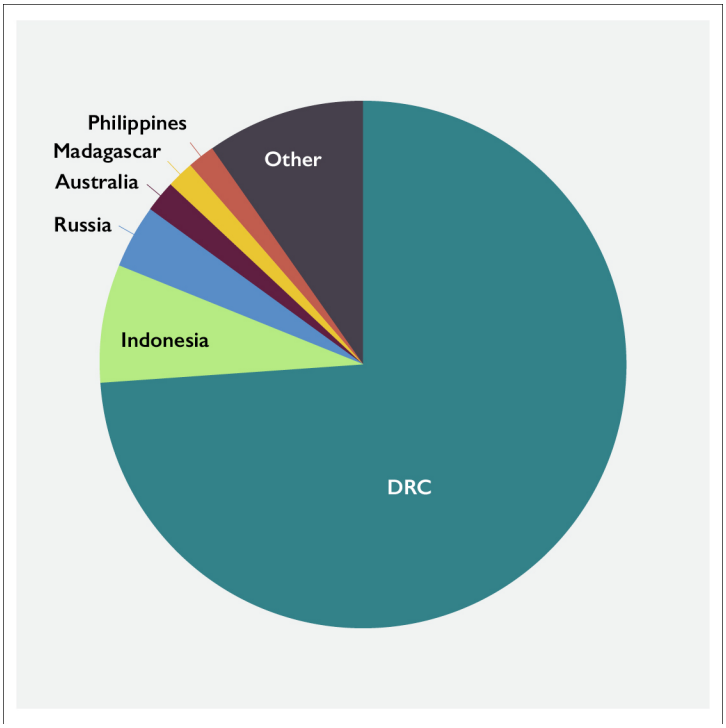
Figure 1. Global copper production by country, 2023



Note: Depicts shares of global mine production of copper not refinery production
Source: USGS, 2024

Global cobalt production in 2023 was 238 thousand metric tons, up significantly from 198 thousand metric tons in 2022 (U.S. Geological Survey, 2025). The DRC has consistently ranked as the world's largest producer of cobalt. In 2023, the DRC accounted for 74% of global production, followed by Indonesia (8%), Russia (4%), and Australia (2%), while Zambia accounted for 0.09% (U.S. Geological Survey, 2025). This critical battery metal's production remains highly concentrated geographically, with the DRC's dominant position raising ongoing supply chain security concerns for industries dependent on cobalt for electric vehicle batteries and other high-tech applications.

Figure 2. Global cobalt production by country, 2023



Note: Depicts shares of global mine production of cobalt not refinery production
Source: USGS, 2024

2.3 ZAMBIAN COPPER AND COBALT PRODUCTION

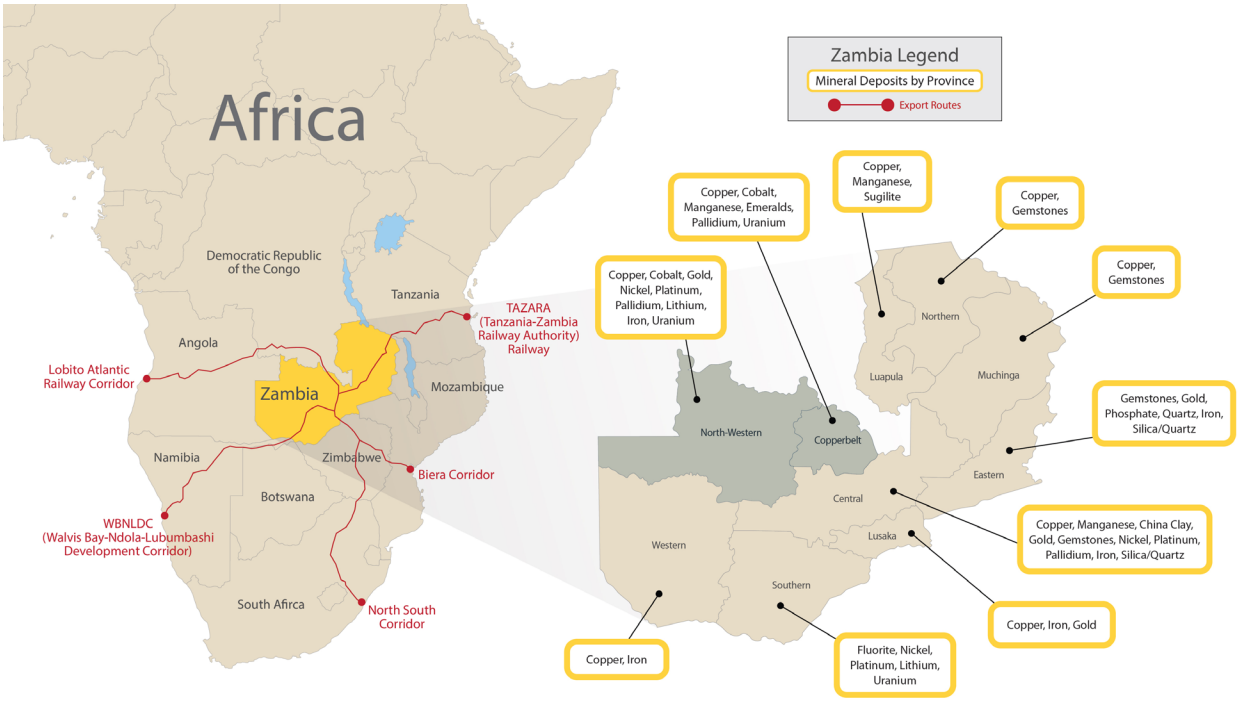
Zambia's mining sector accounted for 9% of the country's GDP, 72% of total export earnings, and 44% of total tax revenue in 2022 (Extractive Industries Transparency Initiative, 2023; PwC, 2024).[1] Copper is the leading mineral extracted within the sector (U.S. Geological Survey, 2025).

In 2023, Zambia produced 698 thousand metric tons of copper (PwC, 2024). This was a decrease from a total of 797 thousand metric tons in 2022 (PwC, 2024). Also in 2023, Zambia produced approximately 251 tons of cobalt, a slight increase from 247 tons in 2021 but significantly lower than the 990 tons produced in 2017 (Copperbelt Katanga Mining, 2025). Analysts attribute these decreases to aging infrastructure at key mines, electricity supply constraints due to drought conditions affecting hydropower generation, and fluctuating global commodity prices (PwC, 2024).

Copper and cobalt mining is concentrated in two main provinces in Zambia, with approximately 80% of the production occurring in Copperbelt Province (including Kitwe, Chingola, Mufulira, Luanshya, and Chambishi) and most of the remainder in North-Western Province (including Solwezi, Mufumbwe, and Kalumbila) (Aurélien et al., 2022; Extractive Industries Transparency Initiative, 2023). Copperbelt Province remains the historical heart of Zambia's mining industry, although large-scale investments in North-Western Province have increased that region's significance in recent years (Copperbelt Katanga Mining, 2025).

[1] Core mining taxes include mining company tax, mineral royalties, and export duty on mineral concentrates (PwC, 2024).

Figure 3. Zambia mineral overview and export routes



Source: ICF

2.4 CHILD LABOR IN ZAMBIA'S COPPER SECTOR

An estimated 400,000 children are involved in work in Zambia, and 1.1% of these children work in the industrial sector, which includes mining (U.S. Department of Labor, 2024). A review of the literature revealed no estimates of the number of children involved specifically in mining. However, some reports indicate that child labor in the informal mining sector is relatively common. According to a report by a non-governmental organization (NGO), children working in artisanal mining are involved in digging, transporting, and crushing rocks (Hapunda, 2022). They also perform tasks such as cooking, caring for children, and selling food. The report indicates that children face health problems as a result of their work, including "bodily injuries, illnesses, sight and vision problems, and exposure to drugs, alcohol, and tobacco" (U.S. Department of Labor, 2023). In 2024, a local newspaper reported that a "high number" of children were found working in mining dump sites, in which former and current industrial mining operations dump mining refuse, in Chingola in Copperbelt Province (Mupeta & Lemba, 2024).

The available literature on child labor in copper and cobalt mining in Zambia is extremely limited, and this study helps fill this gap.

3 METHODOLOGY AND STUDY IMPLEMENTATION

3.1 RESEARCH QUESTIONS

This study was guided by the following research questions:

1. Is child labor present within the copper and cobalt industries in Zambia?
    a. What are the paths of recruitment or entry into work for children?

    b. What are the demographics of children working in the copper and cobalt supply chains?
    c. What are the job characteristics of children working in the copper and cobalt supply chains?
2. Is forced child labor present within the copper and cobalt industries in Zambia?
3. What are the characteristics of the domestic supply chains for copper and cobalt?
    a. Is there evidence that copper or cobalt mined with child labor makes its way into the formal domestic supply chain? At what point does co-mingling occur?
    b. How and to whom do backyard smelters sell copper and cobalt, and in what form?
    c. What downstream domestically produced products carry a risk of being made with copper or cobalt mined with child labor?
4. What is the role of Zambian copper and cobalt within international supply chains?
    a. Is there evidence that Zambian copper or cobalt mined with child labor makes its way into international supply chains?

3.2 METHODOLOGY

The methodology for this study included a combination of secondary data analysis, a quantitative workers' survey, qualitative worker interviews, and key informant interviews (KIIs). The process began with a review and analysis of available reports and trade data, guided by thematic areas of focus related to child labor and the copper and cobalt supply chains. The research team conducted a scoping visit in March 2024 that involved interviews with representatives of industry, government, unions, and civil society. The desk review and scoping findings contributed to both the study design and the final report.

Quantitative workers' survey: The survey of 147 child workers aged 12 to 17 sought to identify the presence and characteristics of child labor in the production of copper and cobalt. The survey design was guided by the International Labor Organization (ILO) model questionnaire for child labor modular surveys (International Labor Organization, 2022) and by ICF's previous child labor studies. The survey captured respondents' socio-demographic information and details about their work and schooling activities.

The survey targeted child workers in Kitwe and Chingola districts of Copperbelt Province and Solwezi and Mufumbwe districts of North-Western Province. These locations were chosen because scoping informants indicated that they have significant numbers of children working and because the local research partner had relationships with gatekeepers in these regions who could facilitate access to participants. All respondents participated in mining activities within the past week and were aged 12 to 17. Those more peripherally involved, such as those selling goods and services to mine workers, were not eligible for the study. The survey employed convenience sampling and identified respondents with the support of local civil society actors and through snowball sampling. Researchers intentionally included workers at both artisanal mines and dump sites. The survey was administered by hand-held tablets on the SurveyCTO platform.

Qualitative worker interviews: Qualitative worker interviews were intended to gather additional insights on the topics covered in the survey. These interviews were administered to 30 participants (14 children aged 12 to 17 and 16 adults) and took place in homes and public spaces. Most interviews lasted around 45 minutes. Each interview was conducted by an interviewer who spoke the language of the respondent (either Bemba or Kaonde).

Key informant interviews: The 24 KIIs gathered information on how the copper and cobalt supply chains in Zambia are structured, what actors are involved and how they interact, and how copper and cobalt produced with child labor could find their way into downstream goods. Respondents were

selected based on their expertise in these areas and included participants from civil society, government, and industry.[2]

The research instruments were adapted from ICF's global research instruments to fit the context of the copper and cobalt supply chains in Zambia. All instruments were translated into Bemba and Kaonde, the two most commonly spoken languages in the data collection areas. Quantitative data analysis was performed using Stata 15, and interview notes and transcripts were thematically coded manually by three coders. All interview notes and transcripts were translated into English. The research team triangulated the results of the qualitative and quantitative analyses to identify key findings and conclusions. This process ensured that all findings were supported by multiple evidence sources and analyses.

3.3 TRAINING AND PREPARATION

Training took place in October 2024 and lasted five days, including a pilot. It comprehensively covered the study objectives, the definition of child labor, research design, fieldwork procedures, research ethics, informed consent protocols, data quality assurance, and a detailed review of the research tools. It also included mock surveys and interviews and feedback sessions aimed at refining interview techniques. Pilot data collection took place in Kitwe, Copperbelt Province. Following the pilot, the research team conducted a debriefing session to discuss challenges encountered and lessons learned. In response to these lessons learned, the research team made minor revisions to the questionnaire to improve respondent comprehension.

Prior to data collection, the research design and instruments were approved by ICF's independent Institutional Review Board and by ERES Converge Ethics Committee in Zambia. Researchers were trained to adhere to strict ethical guidelines, including informed consent, confidentiality, and data security. Research was performed in compliance with 45 Code of U.S. Federal Regulations Part 46 on the Protection of Human Subjects. Verbal informed consent was obtained from all respondents before proceeding with the interview by reading a consent form aloud to them. As required by ethical guidelines in Zambia, children under age 15 provided informed assent, and their parents or guardians provided consent. Youth ages 15 and older provided their own consent. All personal identifying information was redacted before data analysis.

3.4 DATA COLLECTION

Data collection took place from October to December 2024. Researchers administered 147 surveys with workers and 30 qualitative interviews with workers. Data quality was closely monitored in real time by the survey supervisors present in the field to address any issues and review submissions. KIIs used semi-structured interview guides tailored to each respondent's expertise and role. A total of 24 KIIs were completed. Table 1 summarizes the study sample by type of participant and type of data collection.

Table 1. Sample summary

Type of data collection	Workers	Key informants	Total
Surveys	Copperbelt Province: 102 workers North-Western Province: 45 workers		147 participants

[2] One Chinese trader was interviewed. Chinese owners of smelting plants declined to participate in interviews.

Type of data collection	Workers	Key informants	Total
Qualitative interviews	Children (12–17 years): 14 workers Adults (18+ years): 16 workers	24 participants	54 participants

3.5 LIMITATIONS AND CHALLENGES

Sampling method: The workers' quantitative survey used purposive and convenience sampling rather than probability sampling, allowing for a diverse pool of respondents but also introducing limitations. Findings are not statistically representative of Zambia's copper and cobalt industry or child labor practices. However, the data help identify the existence of child labor in the study area and, when combined with qualitative insights, offer a broader understanding of the issue.

Accessing workers: Children younger than age 12 were not directly surveyed or interviewed due to ethical considerations. However, the study found evidence that younger children work in the sector (see *Section 5.1, Characteristics of Child Workers*). As such, the study reflects only the perspectives of older children and adults, without the full representation of working children's experiences. In addition, the workers who participated in the study were recruited through referrals by community members and peers. It is possible that some workers are prevented from communicating with outsiders by their employers, and thus their perspectives are not included in the study. This limitation suggests that the findings may not fully capture the spectrum of conditions experienced by children, as the most exploited children may be inaccessible to researchers.

Sensitive topics: The atmosphere in many of the target communities was tense during the time of the research due to mine accidents and crackdowns on illegal mining. For their own safety and the safety of respondents, researchers were careful with their interview questions. They asked broad, open questions about sensitive topics, and they limited their follow-up probes. As a result, findings on the topics of forced child labor and the role of gangs are more exploratory than conclusive.

Supply chain tracing: Both the cobalt and copper supply chains are complicated by the introduction of informal materials into formal supply chains at many points, including during trading, processing, smelting, and export. In addition, tracing exports of copper from Zambia is complicated by further transactions taking place at sea, running the risk that exports never reach the destination reported by Zambia.

Active mines and production: The discussion of active mines, open-pit operations, processing facilities, and other production sources in this report reflects the best information available at the time of research and should be understood as a snapshot of a dynamic sector. Mine ownership, operational status, production levels, permitting arrangements, and sourcing relationships in Zambia's copper and cobalt sectors are subject to change due to market conditions, investment decisions, regulatory developments, infrastructure constraints, seasonal factors, and site-specific operational issues. As a result, references to particular mines, companies, or production pathways should not be interpreted as a fixed or exhaustive list of active sources over time.

4 SUPPLY CHAIN FINDINGS

Both large-scale formal producers and smaller-scale artisanal producers participate in the copper and cobalt industries in Zambia. Both types of supply chains present traceability challenges, with opportunities for the co-mingling of materials from different suppliers appearing at many different points in the processing and trading of these goods.

Ultimately, most cobalt and copper produced in Zambia are destined for export, and unrefined copper and cobalt oxides and hydroxides are the most important export forms of each product. Zambia has been the top exporter of unrefined copper globally since 2017, with most of its unrefined copper (and all copper products) being ultimately imported by China. Most of Zambia's cobalt exports go to South Africa.

4.1 DOMESTIC PRODUCTION OF COPPER AND COBALT

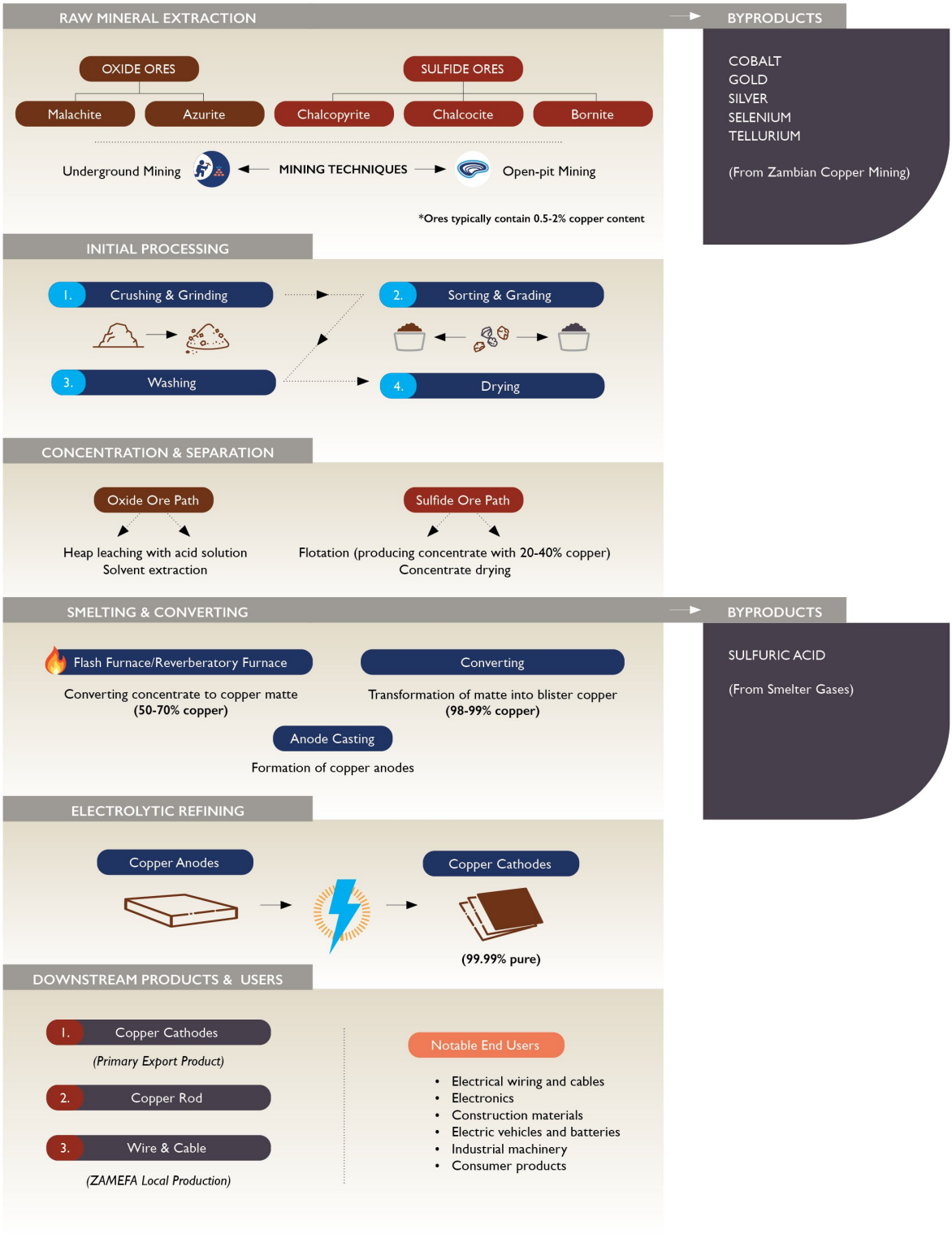
Figure 4 presents a general overview of the steps in copper and cobalt production and processing in Zambia. The specific processes and methods used at each step vary across large-scale mining (LSM) and artisanal and small-scale mining (ASM) production channels, as described in detail in the following subsections.

4.1.1 LSM vs. ASM

In Zambia, copper and cobalt mining can be broadly categorized into two sectors: the large-scale formal sector and the small-scale/artisanal sector. The formal sector uses modern technology and mechanization, employing sophisticated mining methods and processing techniques. In contrast, the small-scale and artisanal mining sector operates with varying degrees of formalization. This sector includes licensed small-scale miners and artisanal miners with permits, as well as informal miners operating without official documentation. As one key informant explained:

> *"There are what we call large-scale traders and small-scale traders and also there what we call large-scale miners and small-scale miners. So, mainly, with large-scale miners, large-scale mining has been attributed with international clients, like so far, there has been joint ventures that have occurred in the large-scale mining because in large-scale mining, government has been involved. But in small-scale mining, though the joint venture activities are happening, they are at a slow pace."*
>
> *—Trader*

Figure 4. Overview of copper and cobalt production and processing



Source: ICF

Under the current legal framework—the Minerals Regulation Commission Act No. 14 of 2024[3]—there are distinct permitting regimes for different categories of mining operations. Artisanal mining rights are exclusively available to Zambian citizens, reflecting the government's policy to ensure local participation in this sector. For small-scale mining operations, the law stipulates that only companies that are citizen-owned, citizen-influenced, or citizen-empowered may obtain licenses.[4] This tiered approach aims to balance economic development with national interests in resource management.[5]

The Minerals Regulation Commission Act establishes specific requirements for small and medium-sized mining operations, including environmental compliance standards, safety regulations, and reporting obligations. These mining operations must submit environmental management plans appropriate to their scale, conduct regular environmental audits, and implement progressive mine rehabilitation measures. Small and medium-sized operators must also maintain records of mineral production and sales, submit quarterly reports to the Minerals Regulation Commission, and pay royalties at rates that are generally lower than those imposed on large-scale operations.

For artisanal miners, the regulatory framework includes simplified procedures for obtaining mining rights, reduced environmental compliance requirements, and access to designated mining zones. The government has established Artisanal Mining Areas where these operators can work legally without competing with larger companies. Artisanal miners are required to register with the local mining office, maintain basic safety standards, avoid the use of harmful chemicals like mercury, and sell their minerals through authorized buying centers.

Informal miners without official documentation constitute a significant portion of Zambia's mining workforce but operate largely outside the regulatory framework. Government approaches to this group have oscillated between enforcement crackdowns and attempts at formalization through amnesty periods and streamlined registration processes (Nachilembe, A., 2018; Republic of Zambia, 2022). These miners face constant risk of eviction or prosecution while also facing exploitation by middlemen and traders. Recent policy initiatives have focused on creating pathways to formalization rather than criminalization, including the establishment of cooperative structures and reserved areas specifically for artisanal mining activities (Dentons, 2025; Transparency International Australia, 2020). However, the effectiveness of these approaches remains limited by institutional capacity constraints and the economic realities that drive informal mining activities.

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[3] The legal framework governing mining operations in Zambia recently underwent a significant overhaul. The Minerals Regulation Commission Act No. 14 of 2024 now serves as the principal legislation for the mining sector. This act was officially signed into law on December 20, 2024, superseding the previous Mines and Minerals Development Act, No. 11 of 2015, which had been the governing legislation for nearly a decade. One significant change in the 2024 Act is the consolidation of regulatory functions. The 2015 Act distributed these responsibilities across multiple departments within the Ministry (Director of Mines, Director of Geological Survey, Mining Cadaster, and Director of Mines Safety, per Section 5), but the new legislation centralizes all these roles into a single body—the Minerals Regulation Commission.

[4] In Zambian mining, "citizen-owned" refers to a company in which at least 50.1% of the equity is owned by Zambian citizens, and in which citizens have significant control of the management. "Citizen-influenced" means a company in which 5–25% of the equity is owned by citizens, and in which citizens have significant control of the management. "Citizen-empowered" refers to a company in which 25–50% of the equity is owned by Zambian citizens (International Comparative Legal Guides, 2024).

[5] These different categories of mining license are also differentiated by geographical size. Artisanal mining permits can be granted for land areas up to a maximum of two cadastre units (6.68 hectares), small-scale mining permits can be issued for plots ranging from 2 to 300 cadastre units (1,000 hectares), and LSM permits can be issued only for plots larger than 300 cadastre units (1,000 hectares). This contrasts with the prior regulations, enacted in 2015, which had limited small-scale licenses to 400 hectares.

4.1.2 LSM Copper and Cobalt Production

4.1.2.1 Extraction

LSM operations in Zambia employ sophisticated extraction methods for both copper and cobalt, varying based on whether mining is underground or open-pit. These operations are highly mechanized and follow structured mining plans developed through extensive geological studies and engineering designs. The production processes in large-scale mines operate year-round.

Underground Mining

Underground mining in Zambia, particularly in Copperbelt Province, involves complex systems for accessing deep ore bodies containing copper and, in some cases, cobalt as a byproduct.

The process begins with shaft sinking or decline development to access the ore bodies. Main shafts or declines serve as primary access routes for personnel, equipment, and ore transportation. From these main accesses, miners develop a network of drifts, cross-cuts, and ramps to reach different parts of the ore body.

For actual ore extraction, LSM operations employ various underground mining methods, depending on the characteristics of the ore body.[6] As one LSM artisan fitter explained: "We've got the drilling leagues, from the drilling leagues we have got loaders, and then we have got dump trucks, and then we go to the log breakers, which now sizes the rocks into smaller pieces, which goes now to the crusher, from the crusher we take them to the conveyer belt."

The extraction process uses sophisticated drilling equipment to create blast holes in the ore face, which are then loaded with explosives and detonated according to carefully designed blast patterns. After blasting, the broken ore is loaded using load-haul-dump machines designed for underground use (Ndhlovu, 2020).

The ore is then transported through the underground network using multiple systems, including locomotives, dump trucks, and conveyer belts.

Open-pit Mining

Open-pit mining is more common in North-Western Province at operations like Kansanshi and Lumwana, which are significant producers of copper with cobalt as a byproduct. As one LSM production manager noted: "The peak time of open-pit mining is in the dry season. The rain season is a challenge." These operations involve the removal of overburden (waste rock) to access copper and cobalt-bearing ore.

The process begins with extensive drilling to define the ore body boundaries and establish blast patterns. Large-diameter rotary drills create blast holes that are loaded with explosives. After blasting, massive hydraulic excavators or electric shovels load the fragmented material onto haul trucks with capacities ranging from 100 to 400 tons (Liebherr Group, 2021).

[6] These include room and pillar mining, in which sections of ore are extracted while leaving "pillars" of ore to support the roof; cut and fill mining, which involves removing ore in horizontal slices, then filling the void with waste rock or tailings before mining the next slice; and sublevel caving, in which ore is extracted from underneath, allowing the unsupported rock above to collapse (Aurélien et al., 2022; Energy Capital and Power, 2024).

These haul trucks transport ore to crushing facilities and waste to designated dump sites. The mining progresses in benches, typically 10–15 meters in height, with access ramps spiraling down the pit to allow truck movement between levels.

Operational Considerations for Cobalt

Although copper is the primary target mineral in Zambian LSM operations, cobalt is often extracted as a byproduct, particularly in Copperbelt Province. As one NGO representative explained: "Cobalt is [treated as] a byproduct of the process for Zambia."

The cobalt content in Zambian copper deposits is generally lower than in neighboring DRC, as noted by another NGO representative: "Zambia is more of a copper mine Copperbelt whereas [in] Congo [it] is more of a Cobaltbelt." Nevertheless, that same NGO representative mentioned that cobalt remains economically significant, given its high market value: "The price of cobalt is at 26,000 dollars per ton today," compared to copper at "9,000 per ton."

Cobalt occurs as a naturally present byproduct within the copper-bearing ore deposits of the Copperbelt, and is recovered as a secondary output at several copper processing facilities. While cobalt is not independently mined in Zambia, its presence within copper ore means it enters and moves through the same supply chains, and is subject to the same traceability limitations, as copper.

Both copper and cobalt extraction in Zambia use sophisticated fleet management systems, using Global Positioning System and computer monitoring to optimize truck assignments, track material movement, and manage overall operational efficiency. Water management is also critical, with dewatering systems to remove groundwater and surface runoff from mining areas, which are particularly important, given the seasonal challenges posed by Zambia's rainy season.

4.1.2.2 Processing

LSM operations in Zambia typically integrate processing of both copper and cobalt into their operations. For these formal mines, processing begins with crushing and grinding the ore to reduce it to fine particle size suitable for concentration.

For copper and cobalt minerals, concentration methods vary, depending on the ore type:

- **Sulfide ores** undergo flotation, in which chemicals are added to separate copper and cobalt minerals from waste rock. This process produces copper concentrate with approximately 25–35% copper content, which may contain cobalt as a byproduct.
- **Oxide ores** are subjected to acid leaching to dissolve copper and cobalt minerals, creating mineral-rich solutions (Mining for Zambia, 2016; University of Arizona Superfund Research Center, 2020).

As one metallurgist explained: "The copper is in solution. We basically just process it into a cathode, which is a final product." This process applies to both copper and cobalt, although with variations based on the specific ore composition.

The processing stages often involve handling mixed ores (copper or cobalt ores containing both sulfide and oxide minerals), as described by an LSM production manager:

> *"From the concentrator, we feed, because we are dealing with mixed ore. So, from the mining side we receive ore, then we treat that ore. For the concentrator, we recover the sulfide part of it because it is mixed ore. So,*

we recover the sulfide part and the oxide we feed into TLP, which is Telling Leach Plant, and the concentrate we feed into smelter."

—LSM production manager

4.1.2.3 Leaching and Solvent Extraction

For oxide ores, the leaching process is particularly important. As one metallurgist described:

"We've got a certain particle size that we require to start irrigating. So that particle size, once the ore is crushed, that particle size is coated with acid. We call it pre-leach, from a unit called an agglomerator... We irrigate with acids on the leach pads... We collect those solutions. There are what we call PLS pond, pregnant leach solution ponds."

—Metallurgist

This process extracts both copper and cobalt from the ore, although cobalt processing often requires additional steps due to its different chemical properties.

4.1.2.4 Smelting and Refining

Zambia has several major copper processing facilities, primarily operated by the large mining companies. Mopani Copper Mines and Konkola Copper Mines (KCM) operate integrated smelters and refineries that can produce London Metal Exchange Grade A copper cathodes with 99.999% purity (Mopani Copper Mines Plc, 2024; ZCCM Investments Holdings Plc, 2023).

The smelting process converts copper concentrate into blister copper (98–99% pure) and then into copper anodes (Mining for Zambia, 2016; University of Arizona Superfund Research Center, 2020). For cobalt, specialized processes extract it from copper processing streams or from dedicated cobalt ores.

4.1.2.5 Electrolytic Refining

Both copper and cobalt undergo electrolytic refining to produce high-purity metal. For copper, anodes undergo electrolytic refining to produce the final copper cathodes. Cobalt also undergoes electrolysis to produce high-purity cobalt metal.

4.1.3 ASM Copper and Cobalt Production

4.1.3.1 Extraction

ASM operations in Zambia employ labor-intensive extraction methods that contrast sharply with LSM operations. These methods are characterized by minimal mechanization, limited capital investment, and heavy reliance on manual labor. The heavy reliance on manual labor is a driver of child labor in the sector.

Manual Extraction

Many ASM operations in Zambia focus on surface mining, particularly in abandoned mine sites, dump sites (locally known as "tailings"), and shallow open pits. Other ASM operations use underground mining.

For surface extraction, the extraction process begins with site identification based on visual indicators and local knowledge. Miners use shovels and picks to clear vegetation and overburden to expose mineral-bearing soil or rock, and then use hammers or chisels to break and extract the ore. Miners often work in groups, with individuals assigned specific tasks such as digging, sorting, or transporting material.

"We do manual work. There was also small sacks like that. They go there in groups, and they're using the shovels and then they're packing in 25 kg, and they are lifting."

—ASM miner, adult

In dump sites and waste rock areas, extraction involves digging through discarded material from previous LSM operations. These dumps contain low-grade ore that was previously considered uneconomical to process but has become viable for ASM workers who can selectively target higher-grade portions. A trader described these activities:

"Myself I source my copper from tailings [dump sites]. We've got tailings here in Kitwe, we've got tailings in Chingola, we've got tailings in Chambishi, we've got also tailings in Mufulira, and also Chililabombwe."

—Trader

In shallow pit mines, ASM miners frequently employ rudimentary excavation techniques. For harder rock material, miners use hammers to break larger pieces into manageable sizes. In some cases, they employ very basic drilling techniques using manual or rudimentary power drills, followed by simple blasting methods. However, blasting is less common in copper and cobalt ASM as compared to other minerals like gemstones, due to the nature of the deposits being worked.

In underground mining, miners dig shafts or ramps to access minerals below, as described by an underground mine worker:

"The tunnels are usually long and complex. For example, a winch might start here and extend all the way to that pole over there. From there, the path goes downward, then straight, and continues in different directions. It's similar to digging a well—it may seem like it ends, but then it turns, drops further, and continues straight again. These tunnels are usually very deep."

—ASM miner, adult

Cobalt as a Byproduct in ASM Copper Operations

Copper is the primary focus of ASM operations in Zambia, and cobalt extraction is much more limited. As one small-scale miner candidly stated:

"I'll concentrate much on copper because cobalt is mainly mined by the big mines, and it is more valuable than copper. I don't want to say much about cobalt."

—ASM miner, adult

This reluctance to discuss cobalt mining may reflect several factors:

- Technical challenges in identifying cobalt minerals, which are less visually distinctive than copper minerals
- The occurrence of cobalt primarily as a byproduct in copper deposits, making selective extraction difficult
- The greater complexity involved in processing cobalt-bearing materials
- Potentially greater scrutiny from authorities, given cobalt's strategic importance

When ASM miners do encounter cobalt-bearing materials, they typically sell these alongside copper minerals to traders or processors without separate handling or processing.

4.1.3.2 Initial Processing

After extraction, some ASM operations employ basic processing methods to prepare copper and (rarely) cobalt-bearing minerals for sale.

Manual Sorting, Grading, and Concentrating

Initial processing in Zambian copper ASM operations primarily involves sorting and concentrating through manual methods. After extraction, miners typically sort the material by hand, separating visible copper-bearing ore from waste rock based on color, texture, and weight. This manual sorting relies heavily on miners' experiential knowledge, particularly for copper minerals that typically appear as green, blue, or turquoise rocks (malachite and azurite) or dark sulfide minerals. Several workers mentioned that Chinese traders taught them to identify minerals:

> *"They were some Chinese who came and wanted copper from waste product chrome. So, they showed us how it looks and the percentage it must contain so that is how we started looking for that chrome, yes that is how we started that work."*
>
> *—ASM miner, adult*

Another miner explained that over time, miners "have reached a level where just use our eyes" to identify minerals.

Undertaking this initial sorting allows ASM operations to increase the grade of material before selling to buyers. As one miner explained:

> *"This shovel we use separates high grade and low grade, and we place them that way. But you will find that, at the site we work from, the excavator uses a machine, because its bucket is huge. So when they find high grade and low grade, it fails to separate the two."*
>
> *—ASM miner, adult*

After sorting, some ASM miners, particularly those working in dump sites or with specific types of copper ore, perform minimal processing on-site, mainly involving basic concentration through manual methods. These techniques include the following:

- Hand-cobbing: Using hammers to break larger pieces and manually separate visible copper minerals from waste rock
- Washing: Removing clay and other impurities using water from local sources. This task is sometimes performed by younger children and by girls and women.
- Drying: Spreading wet material in the sun to reduce moisture content

The drying process is particularly important, as one trader described:

> *"When you dig out sometimes, it has water. So when it has water, that is moisture. So that moisture will reduce the copper percentage. So we have our yard where we take. When we pile there, we wait for three to four days for it to dry. At the moment we take, measurement could be 1.6%. Go there after three or four days, it'll be 3%."*
>
> *—Trader*

4.1.3.3 Sale to Processors

Most ASM operations sell their cobbled, washed, and dried ore to local traders rather than attempting more advanced processing themselves. These buyers typically transport the material to processing plants, where more sophisticated concentration and smelting occurs.

The primary buyers of unprocessed or minimally processed copper ore are Chinese-owned processing facilities and local traders. As one small-scale miner described:

> *"After we mine, we pack in tipper trucks. Then we have buyers where we take those things. Yes, we have Chinese whom we take to."*
>
> *—ASM miner, adult*

A trader explained:

> *"The Chinese process that copper. They've got plants within their premises and crusher plants and the like. So once they process the copper, then they export the copper as finished good."*
>
> *—Trader*

Some slightly more established ASM operations or local entrepreneurs have set up basic processing facilities to add value before selling. These small-scale facilities typically include the following:

- Crushing equipment: Small jaw crushers or hammer mills to reduce ore size
- Basic concentration methods: Simple jigs or sluices to separate heavier copper minerals from lighter waste materials
- Rudimentary leaching setups: For oxide ores, using acid leaching in plastic-lined pits

These operations remain limited in scale and sophistication compared to formal sector processing. The processing methods often have significant environmental impacts, including dust generation, acid drainage, and improper waste disposal, as they generally operate with minimal environmental controls or oversight. None of the children interviewed for the study mentioned involvement in this type of processing.

4.1.3.4 Cobalt Byproduct Processing in ASM Operations

The study found limited evidence of small-scale cobalt processing in Zambia. Most ASM miners focus on copper rather than cobalt, likely due to the technical challenges in cobalt recovery and processing.

When cobalt-bearing minerals are encountered in ASM operations, they are typically sold to traders, who then supply them to larger processing facilities, with limited or no separate processing occurring in the ASM sector itself. Unlike in neighboring DRC, where artisanal cobalt mining is more established, Zambian ASM operations rarely target cobalt specifically or employ specialized methods for its extraction or processing.

4.1.4 Mechanization in Copper and Cobalt ASM in Zambia

The degree of mechanization in Zambian copper and cobalt ASM varies considerably across sites and operations. Most remain predominantly manual, but there has been a gradual introduction of basic mechanized equipment in some more established operations.

At the most basic level, some ASM operations have incorporated simple water pumps to remove water from pits, especially during and after the rainy season:

> *"So when working we could even find water, so we had a pump whereby if we find water, we just start the pump as it is draining water, then you can easily see whether there are minerals or not, and if there are minerals, then you continue working."*
>
> *—ASM miner, age 15*

These pumps range from small, portable petrol-powered units to slightly larger diesel pumps, enabling mining to continue in areas that would otherwise be flooded. These are rarely owned by the ASM miners themselves but are instead provided by buyers or rented from contractors.

> *"We've got our buyer, a Chinese who gives us the mining equipment. She'll give us the excavator, the loader, and the tipper trucks so that we load and take for her."*
>
> *—ASM miner, adult*

Transportation within mining sites has seen some mechanization, with wheelbarrows being common for moving material short distances. More established operations sometimes use small tipper trucks or pickup trucks for transporting ore from extraction points to collection areas or directly to buyers. These vehicles are often old and poorly maintained but significantly increase the volume of material that can be handled. Some ASM operations have begun to use mechanized tools like excavators and front-end loaders. Like the water pumps, these machines are rarely owned by the miners themselves, and the costs of renting them dissuade many miners from their use.

> *"We encourage ourselves to use our own labor so that we can earn that money [rather than] booking a machine and paying that 10 thousand."*
>
> *—ASM miner, adult*

> *"[You can] pay someone who can load using an excavator, but people feel this method brings less money, therefore they prefer carrying by themselves than pay someone and remain with less money because when they load themselves, they end up with more money."*
>
> *—ASM miner, age 17*

The work of transporting sacks of soil and stones often falls to children, as discussed in *Section 5.3, Children's Jobs in Mining*.

Crushing equipment has also been introduced in some ASM operations, ranging from small jaw crushers powered by diesel engines to slightly larger crushing units. These allow for more efficient size reduction, compared to manual breaking with hammers. Power generation for mechanized equipment typically relies on portable generators, as most ASM sites lack grid electricity connections. This dependence on generators adds to operational costs and limits the scale of mechanization possible.

The seasonal nature of ASM operations also affects mechanization decisions. During the rainy season, when many pits become inaccessible or flooded, expensive equipment may sit idle, making investment less attractive. This seasonality has led some ASM operators to focus on mechanizing transportation rather than extraction, as vehicles can be used for other purposes during mining downtime.

One trader explained how moisture affects value:

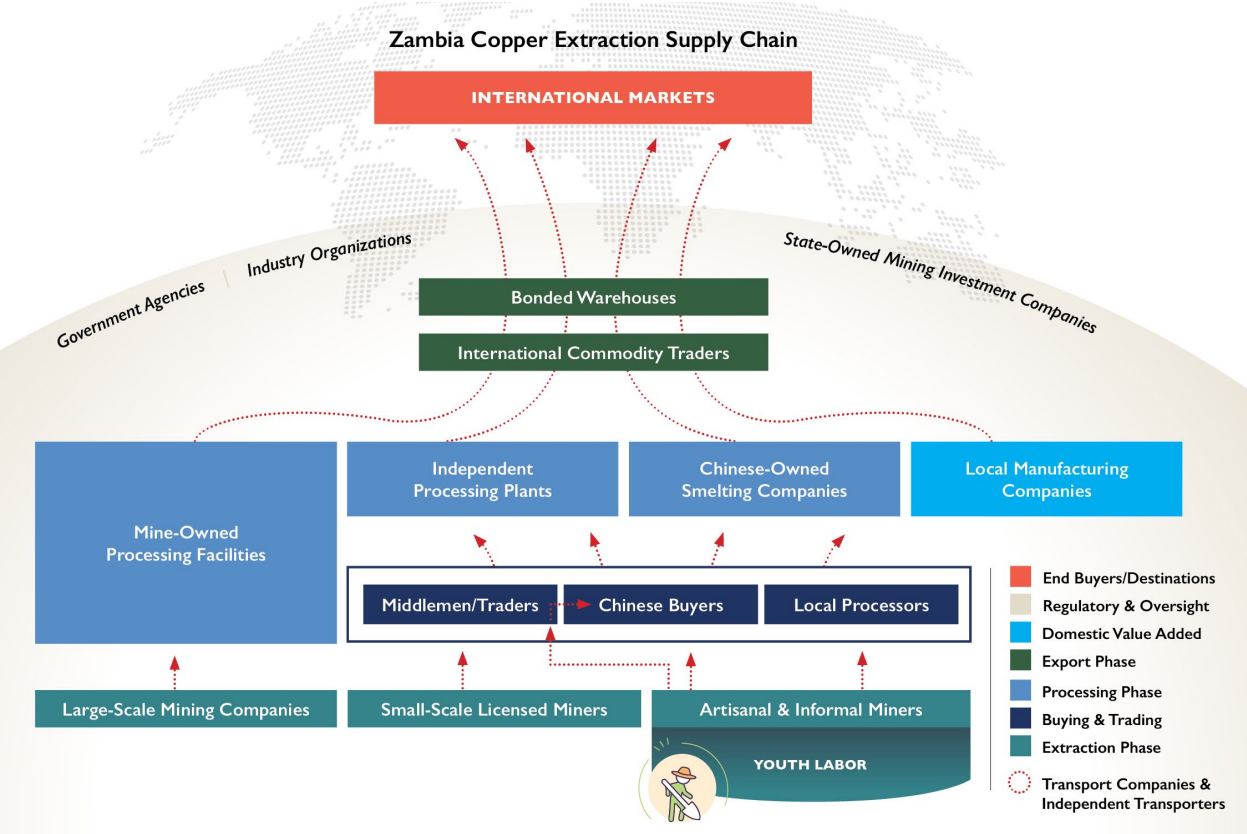
> *"In rain season we mostly find acid soil balls; that copper which looks like sand ... we fail to get it. [The] reason why [is] the moisture content is mostly too high, so you will find that when you load and supply that kind of material, they deduct the moisture content up to somewhere 70%. That leaves you the owner of the material with only 30%."*
>
> *—Trader*

Despite these advances, the level of mechanization remains low, compared to LSM. The majority of ASM operations still rely primarily on manual labor for extraction and processing. Barriers to increased mechanization include limited access to capital, lack of technical knowledge, the informal nature of many operations, and the relatively small scale of individual ASM sites, which makes significant investment in equipment economically challenging.

4.2 DOMESTIC SUPPLY CHAIN TRACING

Figure 5 illustrates the structure of the domestic and international supply chains of copper produced in Zambia, as described in detail in this and the following section.

Figure 5. Supply chain of copper produced in Zambia



Source: ICF

4.2.1 Copper

4.2.1.1 Formal and LSM Copper Supply Chain

Copper extracted in Zambia follows several pathways along the supply chain, with differing degrees of formalization, traceability, and value addition. For the LSM formal sector, the supply chain is relatively well-documented and structured, although challenges in complete traceability remain.

4.2.1.2 Major LSM Operators and Production

The "Big Four" mining companies—First Quantum Minerals, Barrick Lumwana, Mopani Copper Mines, and KCM—dominate this sector, accounting for approximately 80% of Zambia's annual copper production (Lusaka Times, 2023). These companies often sell their cathodes directly to international buyers through formal channels. LSM operations have significantly expanded in recent years, particularly in North-Western Province, where First Quantum and Barrick operate major open-pit mines. The formal sector also includes other players such as CNMC Luanshya Copper Mines and NFC Africa Mining (Chambishi), and newer operations like Mimbula Minerals.

4.2.1.3 Integrated Operations

LSM mining companies typically operate integrated supply chains that include extraction, concentration, smelting, and, in some cases, refining. As a metallurgist at a major LSM site explained:

> *"So we actually do everything from start. That is mining, up to the [final] product. So, we mine and then process and we're able to get about 99.9% in terms of purity copper cathodes and then we actually sell it."*
>
> *—Metallurgist*

The degree of vertical integration varies among companies. Mopani and KCM operate fully integrated operations, from mining through to refining, with smelters located in Mufulira and Chingola, respectively. An LSM worker noted that his worksite has "mining, concentrator, smelter, and also refinery."

First Quantum's Kansanshi operation also maintains an integrated operation, but other companies may focus on certain segments of the supply chain or rely on partnerships for smelting and refining services.

4.2.1.4 Formal Trading and Export Channels

The formal copper supply chain in Zambia is dominated by two major commodity traders: Glencore and Trafigura.

> *"For transportation or trading, there are two major players, so you have Glencore and also Trafigura... These are the two that actually move the minerals from pit to port and also to manufacturers."*
>
> *—Due diligence manager, NGO*

These Swiss-based commodity traders serve as key intermediaries, purchasing large volumes of copper from Zambian producers and selling to international markets. Trafigura, which also owns Puma Energy, has established a significant presence in Zambia's copper trade. Glencore, despite divesting from Mopani Copper Mines in 2021, continues to purchase substantial quantities of Zambian copper through off-take agreements.

> *"In 2023, I think it was, Mopane produced 65,000 tons of copper, out of which 54,000 tons went to Glencore. The difference, which is about your 10,000, is the one that remained here and it was purchased by two companies, ZAMEFA [Metal Fabricators of Zambia Plc.] and Neelkanth."*
>
> *—Due diligence manager, NGO*

These off-take agreements often include financing arrangements that provide mining companies with capital for operations in exchange for guaranteed future production at pre-agreed pricing formulas.

4.2.1.5 Informal and ASM Copper Supply Chain

For the ASM sector, the supply chain is more complex and often less transparent.

Small-scale miners typically sell their ore or concentrate to local traders or middlemen, who then either process it themselves or sell it to processing facilities. These initial sales transactions often occur with minimal documentation or formal contracts. One trader described his role:

> *"I engage with mine owners, those that have got mines that are doing extraction. I also engage with those that can do the processing. So, I get the ore from the extractors where they are extracting, I take to the processors where they are going to process the concentrators."*
>
> *—Trader*

In some cases, buyers finance the mining operation in return for an exclusive right to purchase any materials produced.

> *"Some financiers reserve tunnels, ensuring that only they can buy the minerals extracted from there. Once the financier gets their share, others can also buy, provided they have the money."*
>
> *—ASM miner, adult*

Local traders serve as important intermediaries, purchasing from multiple small-scale miners and aggregating material before selling to processing facilities.

4.2.1.6 Role of Chinese-Owned Processing Facilities in ASM Copper Supply Chain

Chinese-owned processing facilities play a pivotal role in the ASM copper supply chain in Zambia. These facilities have established numerous processing plants throughout Copperbelt Province, creating a parallel supply chain that connects informal miners to formal markets.

Acting as key intermediaries, they purchase copper from ASM miners or from traders who purchase from ASM miners who often lack alternative buyer options, and then process this material using equipment ranging from basic crushing operations to more sophisticated concentration and smelting facilities.

> *"The Chinese have come in and they are buying a lot from these informal miners in small-small quantities that are being supplied to them continually."*
>
> *—Trader*

> *"My primary buyers? The Chinese men... Of late I've never had other buyers apart from Chinese."*
>
> *—Trader*

Miners indicated that only certain members of the community have direct access to the Chinese processers.

> *"There are people who cannot sell to the Chinese people because the people who sell there are well known. Selling starts amongst ourselves from one person to another and vice versa until it goes to those who sell to the Chinese. If you decide to sell directly to the Chinese people as an individual, it becomes difficult because they think you will disturb their business… They have their own people that they do business with… And it is not fair."*
>
> *—ASM miner, age 16*

> *"Making a deal with the Chinese to send cargo [minerals] is difficult. Therefore, I sell it through those people who have direct access to the Chinese."*
>
> *—ASM miner, adult*

> *"Each one of us decide where to sell and which buyer we want. Buyers differ. There are those who even buy lunch [nshima and water] when we are working. When we finish working, we know that this person provided [food] so we sell to them and then they go and sell to the Chinese."*
>
> *—ASM miner, adult*

Selling through a trader or directly to Chinese processers also depends on the quantity and type of minerals to be sold.

> *"If you are working alone, you can sell alone, but if you are two or three you sell as a group, except when selling low grade because it cannot be sold directly to the Chinese. They cannot buy because the*

concentration of copper is low unless you put together, so selling is done through the people who have the contracts with the Chinese people, but with high grade it is possible to sell as an individual."

—ASM miner, adult

These Chinese-owned facilities range from small-scale operations to more substantial plants. They typically perform more advanced processing than ASM miners can achieve, including crushing, concentration, and, in some cases, smelting.

Some Chinese buyers have developed mutually beneficial relationships with ASM miners by providing equipment and transportation to increase production capacity, but the pricing structure in these transactions frequently disadvantages the miners, who report being underpaid for their material due to limited bargaining power. One miner described this power imbalance:

"When we take to the Chinese, they will find a big percentage in the high grade, but they will say they are only buying the one with a low percentage, so that they cheat and steal from us. So for us, the fact that we don't have access to other buyer options, we swallow a bitter pill and are forced to supply the material so that we get less money instead of what the material is worth."

—ASM miner, adult

The geographical distribution of these Chinese-owned facilities is widespread throughout the Copperbelt. One key informant noted:

"You find that in all these places, Chinese people have installed their smelting plants, and so on and so forth, so when those Zambians doing the extraction of the materials, they will take their materials to smelters that belongs to the Chinese and the Chinese do the smelting."

—Trader

4.2.1.7 Backyard Smelters

Alongside larger Chinese-owned processing facilities, numerous smaller "backyard smelters" operate throughout the Copperbelt. These operations typically process smaller volumes of material with less sophisticated technology, but collectively they represent a significant processing capacity within the informal sector.

Interviewees did not provide extensive detail on the specific operations of these backyard smelters, but they were mentioned as part of the landscape of informal processing. One key informant alluded to these operations:

"There are these self-made smelters…When these guys take that stuff, they just find a Chinese who tells them dump this side, dump here, dump here, dump here."

—Union representative

These backyard smelters typically operate with limited environmental controls or regulatory oversight. They often employ basic pyrometallurgical methods to produce crude copper blister or copper-rich intermediate products, which are then sold to larger processing facilities for further refining.

4.2.2 Cobalt

The cobalt supply chain in Zambia is less developed and more concentrated than the copper supply chain. Major cobalt-producing operations include the Mwambashi Mine, Muliashi Project, Baluba Center Mine, and Chambishi Southeast Project in the Copperbelt (Energy Monitor, 2023). Chinese investment

is prominent in the cobalt sector, with China Nonferrous Mining Corporation having significant ownership stakes in several key operations (Egyin, 2024; Verneau, 2023).

For cobalt processing, Chambishi Metals (operated by ERGA) is particularly significant because, in addition to being the only refinery in Zambia that refines and produces cobalt metal, it is one of the largest joint cobalt and cobalt refineries in the world (ERG Africa, 2024).

Interview respondents provided limited insights into the specific processing pathways for cobalt, suggesting that knowledge of and engagement with the cobalt supply chain is less widespread than for copper.

Recent developments suggest increased international interest in Zambia's cobalt resources. The United States and the European Union have both signed strategic partnerships with Zambia related to critical raw materials, including cobalt, for battery supply chains and electric vehicles (European Commission, 2023; United States Department of State, 2023). A copper and cobalt trader stated:

> *"With the recent discovery of electric vehicles, the copper-cobalt industry has boomed. So if you look at Zambia DRC, the mining has somehow increased and a lot of partners have come in for joint partnership."*
>
> *—Trader*

4.3 TRACEABILITY CHALLENGES AND SUPPLY CHAIN CO-MINGLING IN ZAMBIA'S COPPER AND COBALT SECTORS

The evidence from interviews with stakeholders across Zambia's copper and cobalt supply chains reveals multiple points at which formally and informally produced materials become co-mingled. The trading, processing, smelting, and export stages all present opportunities for informal material to enter formal supply chains.

Zambia has implemented various systems to formalize mining activities, including trading permits and mineral royalty taxes, but these systems can inadvertently facilitate the integration of informally sourced material into formal supply chains. The technical requirements for blending materials from different sources at smelters further complicate traceability.

For both copper and cobalt, once material has been processed and particularly after smelting, it becomes virtually impossible to determine its original source with current systems. This creates significant challenges for downstream buyers seeking to ensure responsible sourcing of Zambian copper and cobalt.

4.3.1 Points of Co-mingling in the Supply Chain

As discussed previously, the Zambian copper and cobalt supply chains present significant traceability challenges, with several critical points at which formally and informally produced materials become co-mingled. Based on interview evidence, these points of convergence occur at multiple stages of the supply chain.

4.3.1.1 Traders and Middlemen

Traders and middlemen play a pivotal role in facilitating the entry of informally mined copper and cobalt into formal supply chains. As one trader explained:

> *"I am a legal trader by the Zambian laws, am legalized to trade with minerals… I have obtained the mineral trading permit, and I am a registered entity… Through that mineral trading permit now I will obtain*

my copper from those people that do not have the documentation… I will declare it to the Ministry of Mines and to ZRA [Zambia Revenue Authority] to pay tax for it, and as I make the payment for the tax, the mineral loyalty tax. When I pay the mineral loyalty tax then that material, those minerals become clean for me… Having those documentations, then my copper will be able to move freely from the country of origin to the country of their destination."

—Trader

This process effectively allows copper from informal sources to enter the formal supply chain with proper documentation. The trader further elaborated:

"I can get concentrates from the informal and take it to the formal, I can also get concentrate from the formal and take it to the informal [smelting companies]... at some point everything becomes legal because the documentations that I have permits me to get the copper from anywhere."

—Trader

4.3.1.2 Chinese-owned Processing Facilities

Chinese-owned processing facilities and smelting operations represent a significant pathway for ASM material to enter formal supply chains. These facilities often accept copper from multiple sources, including small-scale miners and traders. These processing facilities aggregate material from various sources before selling more refined products (blisters, anodes, or cathodes) to larger companies or directly to international markets.

4.3.1.3 Smelting Operations

Smelting operations represent perhaps the most significant point of co-mingling in the copper and cobalt supply chains.

Some LSM companies with smelting operations regularly purchase external concentrate to optimize their smelting processes. As described by a manager at one LSM site:

"So in order to get that concentrate blend, we sometimes procure concentrate from other mines. So even that is something that is done under my department. So we source for concentrate to help the smelter blend with our own concentrate."

—LSM supply chain manager

This technical necessity to blend concentrates with different chemical properties creates an entry point for ASM-produced materials.

"Obviously the storage you can have it separately but when you are treating, you have to blend. Because you have to blend so that you have a blend that will give you the best recoveries...These sources are of different qualities, and you are looking at the concentrates that have got different elements in it so you want to blend before you treat."

—Production manager, large smelting facility

While the primary suppliers of concentrate are typically other LSM operations, smelters may become less selective about sources during periods of concentrate shortages.

Interviewees suggested that major LSM companies with temporary processing capacity constraints commonly purchase semi-processed materials during production shortfalls.

"The smelting capacity is huge… [but] from our own production, what we get is very small. So, to supplement that, we get from other sources."

—LSM manager

One transporter indicated that while some large-scale mines like KCM and Mopani generally do not buy from small-scale miners, Chambishi Copper Smelter is more "flexible" in its sourcing, noting that he was aware of that facility purchasing concentrate from traders who source from both formal and informal operations, thereby indirectly incorporating ASM-sourced copper into their supply chain.

"CCS [Chambishi Copper Smelter] is flexible—it accommodates external clients to be bringing commodities for smelting."

—Transporter

Interviewees indicated that smaller smelters—particularly Chinese-owned operations—openly source material more broadly, including from informal miners and traders.

4.3.1.4 Export Channels

The export stage represents the final point of co-mingling before copper and cobalt leave Zambia.

According to traders interviewed for this study, the export process begins when a trader with copper concentrate secures a buyer, typically from countries like China, the United Kingdom, or Canada. After agreeing on price and transaction type (free on board; cost, insurance, and freight; or free carrier), the trader must transport the concentrate from their warehouse to the buyer's chosen bonded warehouse. Before this transfer, the trader must obtain several official documents: mineral trading permit, mineral export permit, mineral evaluation certificate, mineral analysis certificate, and certificate of origin. After paying required taxes to the Ministry of Mines and Zambia Revenue Authority, the trader delivers the concentrate with all documentation to the bonded warehouse, where laboratory analysis verifies the material quality before shipment to international destinations.

Co-mingling primarily occurs before this export documentation phase. Licensed traders routinely purchase copper from both formal and informal sources, including ASM operations that may involve child labor.

This legitimization through documentation effectively "launders" informally sourced copper into the formal export chain. Once the minerals enter the bonded warehouse system with official documentation, their problematic origins are effectively obscured. The buyer and bonded warehouse then organize shipment of the material to international markets without any means to identify or track potentially problematic sources in the supply chain.

4.3.1.5 Mechanisms that Facilitate Co-mingling

Several mechanisms facilitate the integration of informally produced copper and cobalt into the formal supply chain:

- **Permitting and documentation systems:** The mineral trading permit system allows traders to purchase from informal sources and then "formalize" the material by paying appropriate taxes.
- **Technical requirements for blending:** Smelters and processing facilities require specific blends of material for optimal processing, creating a technical need for co-mingling. This blending requirement further complicates traceability.

- **Lack of chain-of-custody systems:** There is a notable absence of robust chain-of-custody systems within Zambia's copper and cobalt supply chains. Once material changes hands, particularly after processing, there is limited ability to trace its origin. One manager at an LSM site, when asked about tracing copper from various sources, responded: "I'm not sure. This information can be obtained from the people who own the smelters."
- **Limited government oversight:** Limited government oversight of small-scale mining and processing operations creates space for informal material to enter the supply chain. A small-scale processor highlighted the lack of government oversight: "For us, what I can say is that the way we look at safety, we have reached a level where we make our own safety... that does not exist on the black market."

4.3.1.6 Systematic Integration of ASM Material into Formal Supply Chains

The evidence strongly indicates that informally or ASM-produced copper (and to a lesser extent cobalt) regularly enters the formal supply chain in Zambia. This occurs through several mechanisms:

- **Formal traders purchasing from informal miners:** Licensed traders routinely purchase material from informal miners and then sell it to formal channels.
- **Processing at Chinese-owned facilities:** Chinese-owned processing facilities accept and process material from informal sources before it enters more formal channels.
- **Legal "laundering" through tax payment:** The payment of mineral royalty taxes effectively legitimizes informally sourced material, allowing it to enter formal export channels.
- **Blending at smelters:** The technical necessity of blending different copper concentrates provides a mechanism and justification for incorporating informally sourced material.

A manager at an LSM mine noted that due diligence is important, but in some cases they need to rely on artisanal miners: "For a place like [my company], we understand that artisanal miners are also key. You find that artisanal miners are also producing concentrate in a spec range that we would require. Due diligence first for us is key in as far as where is this material mined."

4.3.2 Implications of Supply Chain Co-mingling for Child Labor Risk

The presence of child labor in the extraction phase of Zambia's copper supply chains, and cobalt produced as a byproduct of copper extraction and processing, (discussed in *Section 5, Child Labor Findings*) combined with the extensive co-mingling documented throughout these supply chains, leads to the conclusion that all copper and cobalt produced in Zambia carry the risk of association with child labor.

4.4 EXPORTS AND INTERNATIONAL DOWNSTREAM TRACING

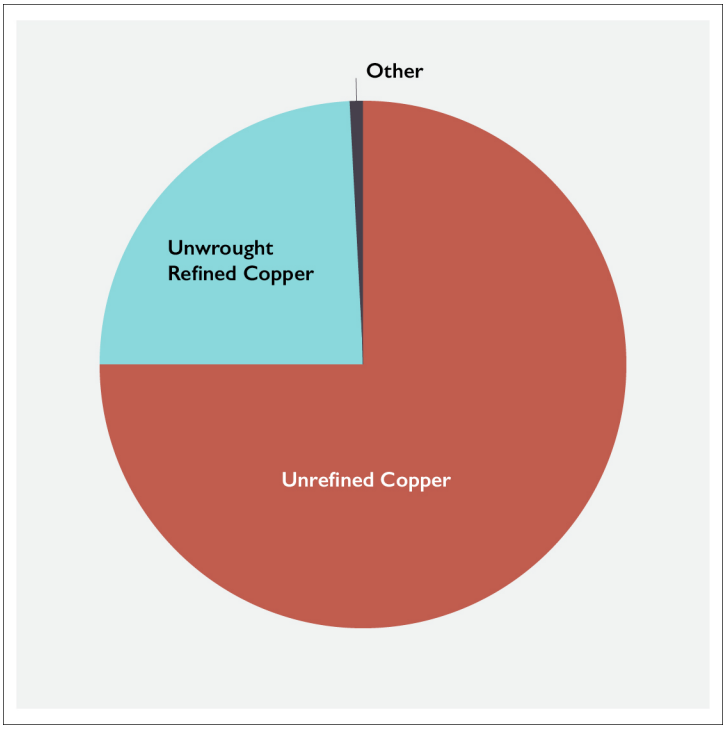
4.4.1 Copper

Zambia exports the vast majority of its copper production, with minimal domestic consumption. According to data from interviews with mining industry officials, approximately 90% of Zambian copper is exported, with only about 10% used domestically by companies like Metal Fabricators of Zambia Plc. and Neelkanth.

As Zambia as is landlocked, all exported copper needs to be driven or shipped by rail to ports in neighboring countries for shipment abroad. Primary ports include Durban, South Africa; Dar es Salaam, Tanzania; Walvis Bay, Namibia; and Beira, Mozambique. Once transported by truck, copper may be temporarily warehoused or shipped immediately.

Zambia primarily exports copper in the form of unrefined copper (more than 75% of all copper-related exports, by value), or as unwrought refined copper and copper alloys (24.3%). The remaining exports, together comprising less than 1% of Zambia's total, come in the forms of copper ores and concentrates; copper bars, rods, and profiles; copper oxides and hydroxides; and phosphides (UN Comtrade, 2025).

Figure 6. Zambia's copper exports by percentage of value, 2023



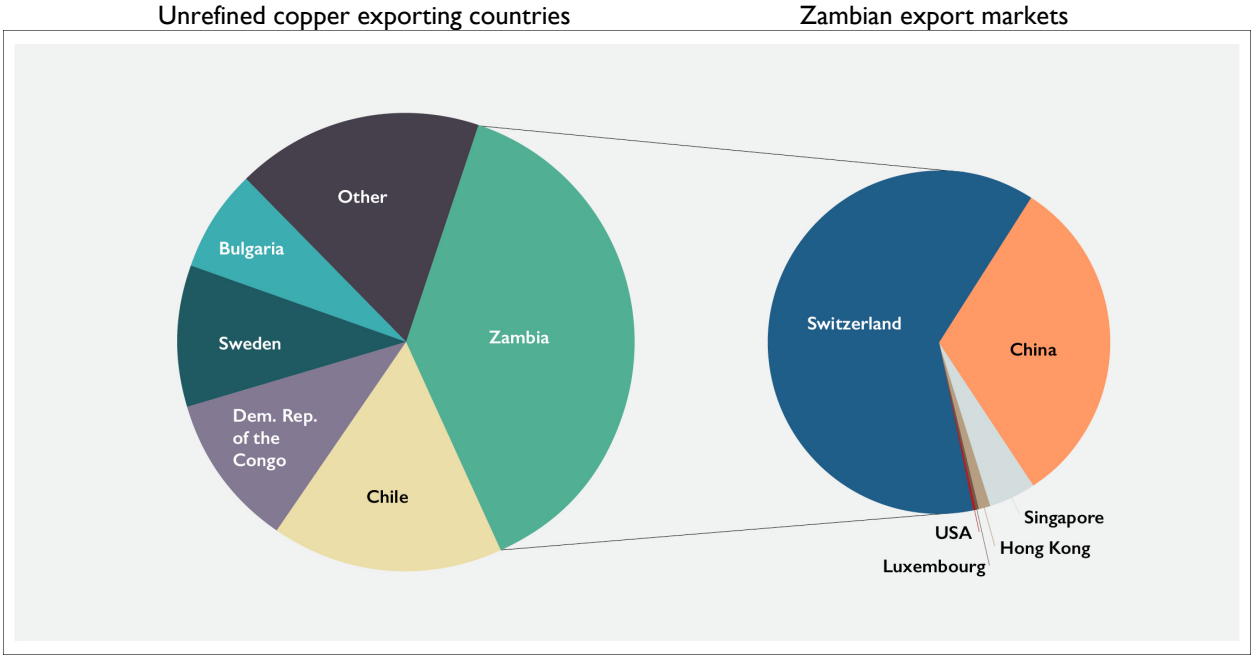
Source: UN Comtrade, 2025

In 2023, Zambia was the top global exporter of unrefined copper, accounting for 38.4% of global exports (UN Comtrade, 2025).

Zambian copper is primarily sold to commodity traders, who arrange shipping and transport of copper and sell to other intermediary traders or industrial consumers. Switzerland is the leading global commodity trading hub for copper from Zambia, in part because of the country's access to finance and insurance, trader-friendly regulations, and low corporate tax rates. When no final destination for the copper has been documented at the time of its sale, Switzerland, as the home country of the initial buyer, is recorded as the importer of record (Dobler & Kesselring, 2019).[7]

[7] Major Swiss commodity traders include Glencore, Metal Corp Trading, Trafigura, and Mercuria.

Figure 7. Zambia's portion of the export market for unrefined copper, by value, 2023



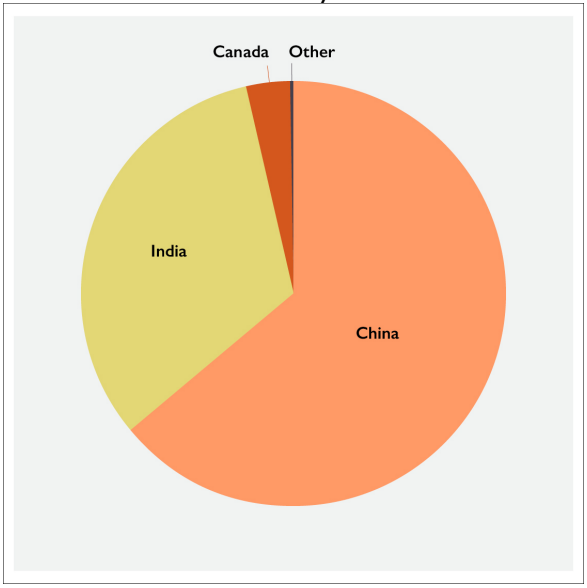
Source: UN Comtrade, 2025; HS Code 7402

However, KIIs and secondary research on Zambian copper exports clarify that nearly all of the copper exports documented as being shipped to Switzerland are sold in transit and then rerouted to another destination. This is reflected in a review of copper exports from Zambia as reported by importing countries.

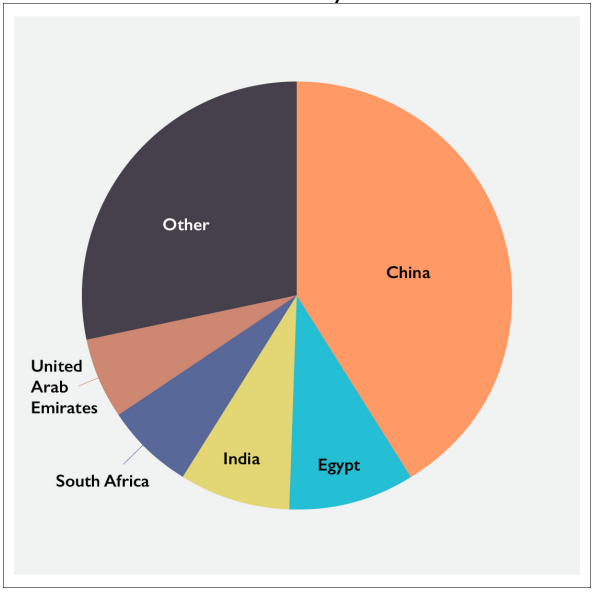
> *"Most contracts actually are reported in Switzerland, but the actual commodity goes east because obviously that is where the factories are."*
>
> *—Due diligence manager, NGO*

Figure 8. Top importers of Zambian unrefined and unwrought refined copper, by value, 2023

Destination of unrefined copper exports from Zambia (HS 7402), as reported by importing country



Destination of refined, unwrought copper exports from Zambia (HS 7403), as reported by importing country



Source: UN Comtrade, 2025; HS Codes 7402, 7403

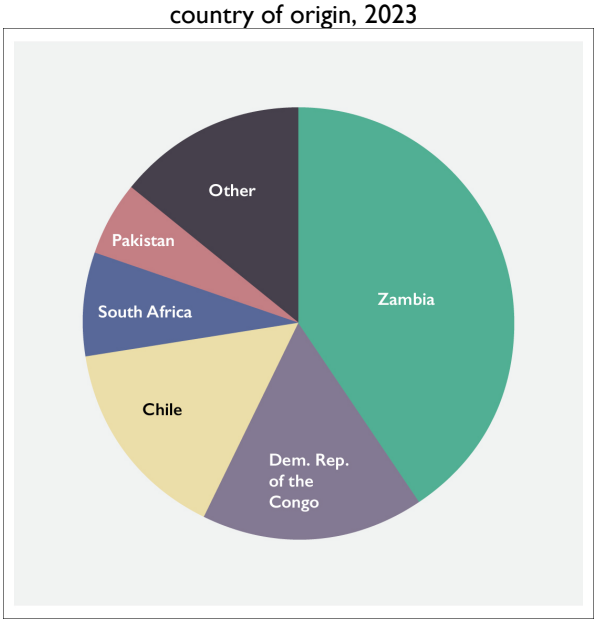
As illustrated in Figure 8, the majority of Zambia's copper exports ultimately flow to China. China accounts for 61.3% of Zambia's copper exports by value overall, including 64% of all Zambian unrefined copper exports and 40.7% of all unwrought refined copper exports.

The next largest portion of Zambia's unrefined copper exports, and a significant portion of its refined and unwrought copper exports, go to India. India is Zambia's second largest destination for copper products overall (27.7%), followed by Canada (2.7%), Egypt (2.1%), and South Africa (1.6%) (UN Comtrade, 2023).

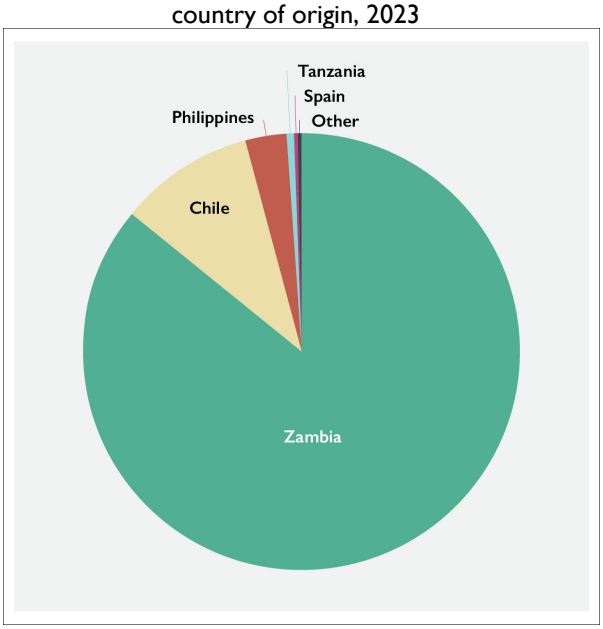
Import data from China and India show Zambia to be a significant supplier of copper for both countries. Zambia is the top supplier of unrefined copper for both China (40.7%) and India (86%).

Figure 9. Sources of unrefined copper imports to China and India, percentage by value, 2023

Overall Chinese imports of unrefined copper by country of origin, 2023



Overall Indian imports of unrefined copper by country of origin, 2023



Source: UN Comtrade, 2025; HS Codes 7402

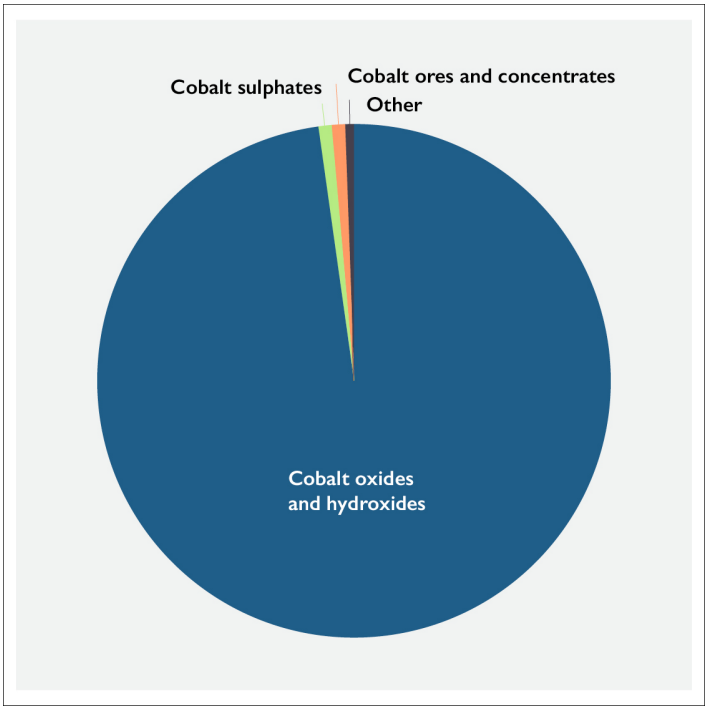
Zambia is also a significant source of unwrought refined copper and copper alloys for India, ranking as its fourth largest supplier (4.3%). While Zambia is only the 14th largest supplier of unwrought refined copper and copper alloys to China (1.8%), China imports refined copper from 85 different countries, with only the top 5 sources accounting for more than 5% of China's total imports.

Based on trade data reported by exporting countries, in 2023, Switzerland was the importing country of record for copper from 50 different countries. According to these data, Zambia was Switzerland's top "supplier" of both unrefined copper and unwrought refined copper, and Switzerland's third largest supplier of copper ores and concentrates (after Armenia and the United States) (UN Comtrade, 2025).

4.4.2 Cobalt

Almost all of Zambia's cobalt exports come in the form of cobalt oxides and hydroxides, which represent 97.9% of Zambia's cobalt exports, by value. Cobalt sulphates are a very distant second largest cobalt export for Zambia, representing nearly 1% of exports, and cobalt ores and concentrates are the third largest, representing around two-thirds of 1%. Remaining exports include cobalt carbonates, acids, and other products, with none representing more than one-half of 1% (UN Comtrade, 2025).

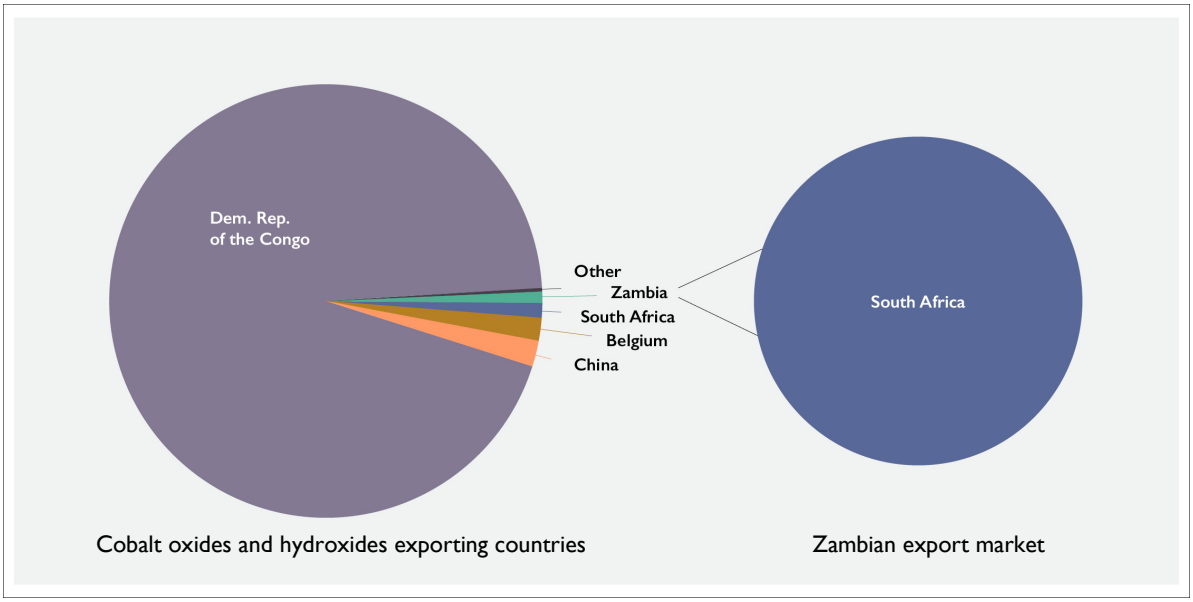
Figure 10. Zambia's cobalt exports, by percentage of value, 2023



Source: UN Comtrade, 2025

According to export data reported by Zambia, in 2023, each of its top cobalt exports went to one single country apiece. All of Zambia's cobalt oxide and hydroxide exports (100%) went to South Africa, and all of its cobalt sulphate exports (100%) went to the DRC (UN Comtrade, 2025). Nearly 100% of Zambia's exports of cobalt ores and concentrates went to Mauritius, apart from trace amounts sent to South Africa (UN Comtrade, 2025).

Figure 11. Zambia's portion of the export market for cobalt oxides and hydroxides, by value, 2023



Source: UN Comtrade, 2025; HS Code 2822

In 2023, Zambia reported exporting $47 million of cobalt oxides and hydroxides, or less than 1% of the global total. This was still enough for Zambia to rank fifth among all exporters, just behind South Africa, which ranked fourth. Zambia reported that South Africa was the sole recipient of its exports. South Africa reported that the primary recipient of its nearly $68 million in exports was China (90.6%), raising the possibility that Zambian cobalt exports may ultimately travel to China, as do most of its copper exports (UN Comtrade, 2025). Zambia did not report directly exporting any form of cobalt to China in 2023, nor did it report any cobalt exports to the United States.

Notably, South Africa did not report importing the $47 million in cobalt oxides and hydroxides that Zambia exported. The only countries reporting imports of these goods from Zambia were Namibia ($1.5 million) and Brazil ($314,582), to which Zambia does not report exporting (UN Comtrade, 2025). Research was unable to account for the reasons for these discrepancies; they may relate to transshipments or import and export dates. The Observatory of Economic Complexity combines these figures and reports overall 2023 exports of cobalt oxides and hydroxides from Zambia to be valued at $48.9 million (OEC, n.d.).

Also in 2023, Zambia reported importing $61.6 million in cobalt oxides and hydroxides from the DRC, thus reporting a net import value of these goods of around $14.6 million.[8] The DRC was by far the world's largest exporter of cobalt oxides and hydroxides in 2023, supplying nearly $4.8 billion, or more than 92% of global exports.

5 CHILD LABOR FINDINGS

This section first presents the characteristics of respondents and the reasons for their work. Next, details are provided on the activities performed by children, work schedules, earnings, exposure to hazards, and relationships with employers. Finally, the section describes the presence of child labor in the mining sector.

Missing responses ("don't know" and "refused") are excluded from the denominator for all estimates. Some estimates are presented for all respondents and some by subgroup. For estimates that are percentages, each row presents both the estimate and the number of respondents who selected the response option (the numerator, denoted by "n"). The number of respondents asked the question (the denominator, denoted by "N") is included at the bottom of tables in which the same number of respondents were asked all questions presented in the table (i.e., all rows have the same denominator). The number of respondents who were asked the question is presented in the final column of the row in tables presenting findings from questions that were asked of different numbers of respondents (due to survey question filters).

5.1 CHARACTERISTICS OF CHILD WORKERS

5.1.1 Demographic Characteristics

Demographic characteristics of survey respondent are provided in Table 2. The sample included more older adolescents than younger adolescents: 16% of respondents were between ages 12 and 13, 35% were between ages 14 and 15, and 48% were between ages 16 and 17. This reflects most qualitative interviewees' perceptions of the age distribution in the sector. Most indicated that it is more common

[8] $61.6 million in imports to Zambia from the DRC less the $47 million exports to South Africa, reported by Zambia. Including the Namibia and Brazil import figures lowers Zambia's net import figure to $12.7 million.

to find older adolescents at work sites than younger adolescents. One adult respondent described a shift from younger children to older children:

> *"Previous we had 13-year-olds and 12-year-olds, but some institutions came and started chasing those in this age group. The officials who used to help us have access to the mines started complaining to us that we were engaging young children, which is why we are now working with those that are 15 and 16 years because their bodies are at least even huge that they can be allowed to enter the mine."*
>
> *—ASM miner, adult*

Although most qualitative interviewees agreed that older adolescents are more common in mining, several mentioned that children younger than age 12 do work in mining. One 12-year-old interviewee noted that he has been working in mining for 2 years. Survey responses also indicate that younger children engage in work in the sector: 63% of survey respondents reported that children younger than age 12 work at the place where they work.

Some interviewees said that children younger than age 12 do not work at their work sites. A young adult interviewee said that 12- and 13-year-olds can work in copper production, but when younger children try to join, the workers chase them off the site. The same respondent also indicated that workers deter women who attempt to mine, stating:

> *"We chase the females. Their area of work is cooking nshima [porridge made from cornmeal that is a staple food in Zambia]. They cannot be cooking nshima and also finding themselves to work at the mine."*
>
> *—ASM miner, adult*

The majority of survey respondents were male (93%). As the interviewee mentioned above, most qualitative interviewees indicated that women and girls are not permitted at their mining sites except to sell food and beverages. However, one interviewee said that while women and girls do not dig or carry minerals at his worksite, they do work washing minerals. The adult interviewee, who works with his 16-year-old son, described his mine site:

> *"The tasks assigned to them are different. For example, the older men are given tasks to dig copper from the pit and then give the ore to young boys, who pick and take to the stream. There you can find even young girls by the stream who are responsible for washing the minerals by the wash bay."*
>
> *—ASM miner, adult*

Table 2. Respondent background characteristics

	%	n
Age (years)		
12–13	16%	24
14–15	35%	52
16–17	48%	71
Sex		
Male	93%	136
Female	7%	11
Number of respondents (N)		**147**

5.1.2 Education

Table 3 presents educational characteristics of respondents. Only 7% have never attended school. Three percent of respondents have completed grades 1–3, 25% have completed grades 4–6, 50% have

completed grades 7–9, and 14% have completed grades 10–12. Regarding current school attendance, the rates decline with age. Although 58% of respondents aged 12–13 and 46% of respondents aged 14–15 attended school the previous week, only 30% of respondents aged 16–17 attended school the previous week.

Qualitative interviewees described an array of arrangements children may use to manage both work and school. Some children described working only on weekends and holidays. Others routinely skip school certain days of the week, for example on Fridays, but typically attend the other days. Some work overnight and then go to school. Some have more erratic schedules:

> *"I go to school, but not regularly."*
>
> *—ASM miner, age 13*

Some children work with the permission or at least awareness of their parents, but others work surreptitiously:

> *"There is a lack of sponsorship from their homes so sometimes people think these children have gone to school and yet they have gone to work in the mines to make money. They wear school uniforms and carry bags, but you find that in the bag there are tools that the child will use when they get to the mine because they have become used to money."*
>
> *—ASM miner, adult*

Overall, 60% of survey respondents reported that they did not attend school last week. An interviewee explained that many children choose not to combine work and school because they would have to reduce their work hours and thus their earnings.

Many respondents reported a highest grade of school completed that was lower than expected for their age, suggesting that working children are falling behind in school. One-third of children aged 12–13, 54% of children aged 14–15, and 62% of children aged 16–17 had completed a grade level below what was appropriate for their age, showing that the percentage of respondents who were behind in school increased with the age of the workers. The average age-grade delay was 2.7 years.[9]

Table 3. Respondent educational characteristics

	Estimate	n	N
Highest level completed			
No formal schooling	7%	10	147
Grades 1–3	3%	5	147
Grades 4–6	25%	37	147
Grades 7–9	50%	74	147
Grades 10–12	14%	21	147
Attended school last week			
12–13-year-olds	58%	14	24
14–15-year-olds	46%	24	52
16–17-year-olds	30%	21	71

[9] These are rough estimates intended to give a general sense of the level of delay. Estimates are calculated based on the expectation that children age 12 will have completed grade 5, age 13 will have completed grade 6, age 14 will have completed grade 7, age 15 will have completed grade 8, age 16 will have completed grade 9, and age 17 will have completed grade 10 (Evaluation World, n.d.).

	Estimate	n	N
Highest grade level completed is below age appropriate			
12–13-year-olds	33%	8	24
14–15-year-olds	54%	28	52
16–17-year-olds	62%	44	71
Average age-grade delay (years)	2.7		80

5.2 ENTRY INTO WORK AND REASONS FOR WORKING

5.2.1 Entry into Work

Interviewees described various paths of entry into mining. Most children described being introduced to mining by their friends or other members of their social networks. Some were encouraged by adults. A 16-year-old who began mining at a dump site at age 12 explained:

> *"The minerals we search for come from mining waste, the leftover dirt after mining. It's the older people who have worked in the mine who told us about this work, suggesting it as something we could do instead of sitting idle at home. They showed us where to find it, and that's how we started."*
>
> *—ASM miner, age 16*

Some interviewees described beginning mining by accompanying their parents or other relatives to their worksite. Others were discouraged by their families from working but did so anyway. When asked why children work in mining, a 17-year-old replied:

> *"The children are actually the main cause. The children do not want school, they want money at an early age, so even when the parents talk [to them about going to school rather than working], they do not listen to them."*
>
> *—ASM miner, age 17*

One interviewee described being coerced into his first day of mine work (see the following box).

Michael

Michael (not his real name), now age 13, has been working in copper mining for 4 years. His entry into the work was not voluntary. He went with a friend to bring water to the friend's older cousin, who was working in a mine. Upon leaving, they encountered a friend of the cousin, who invited them to join him in eating *nshima,* a type of porridge made from cornmeal that is a staple food in Zambia. Michael declined, but his friend ate. After they finished eating, Michael and his friend wanted to leave but were not permitted.

> *"[The cousin] said, 'Where are you going?' We responded that we are going home, then he said, 'You can't leave, because you have eaten our nshima so come and work.' And that was my first time to go to the pit."*

Michael said that going underground was very hard.

> *"When you go in the pit, because when you go inside [for the first time], they fear that you will run way if they put you at the end [of the line of miners pulling out sacks of minerals]. So you need to lie down like this [Michael demonstrated], then the first one, when he packs the minerals [into a sack], then you pull to this level, and your friend behind you does the same, he pulls till it until it comes out. So us we were put in the middle [so that we could not run away]."*

He recalled that not only did he have to endure going inside for the first time, but he had to hear constant insults during the process.

Michael continues to work in mining, though voluntarily now, in addition to attending school full time.

5.2.2 Reasons for Working

When asked why children work in mining, many respondents indicated school-related costs as a motivation. An adult miner explained:

> *"Books are not free. You have to buy uniforms and shoes, so if these things are not there that child won't go to school because they cannot go barefoot to school. […] You cannot be going to school without money for food; therefore, they attend three days and miss two days to go look for money."*
>
> *—ASM miner, adult*

Others described lack of money more generally as a motivation for working.

> *"Sometimes it is because maybe I have a problem that require money, I cannot go and ask my father to say I have this pressing issue. I just have to sort out such things for myself."*
>
> *—ASM miner, age 15*

> *"What we follow is copper and earn some money to take care of our parents in our homes. […] It happens that the things are not good [not financially stable] at home, and everything is on me. That is the cause [why I work]."*
>
> *—ASM miner, age 16*

Other adults argue that children see other children with money or new purchases and want to have the same, and some of the child miners' stories support this assertion. For example, when asked about stopping school for full-time mining, a 15-year-old explained that he failed school, and he was influenced by his friends who had money from mining.

5.3 CHILDREN'S JOBS IN MINING

5.3.1 Work Activities

Most survey respondents performed more than one mining activity. One interviewee described his work:

> *"I break the copper ore and carry bags of copper from one point to another. And if there are elders around, they give us copper stones to wash and sieve before they grade it."*
>
> *—ASM miner, age 13*

According to survey respondents, the most common work activities for children, all performed by more than three-fourths of children, were moving ore within the site or outside the mine (88%), digging for ore without machines (84%), and buying or selling ore (84%) (Table 4). Less common activities were washing copper material (39%) and digging for ore using machines (19%).

Table 4. Work characteristics during the past week

	%	n
Work activities[1]		
Moves ore within the site or outside the mine	88%	130
Digs for ore without machines	84%	124
Buys or sells ore	84%	123
Washes copper material	39%	58
Digs for ore using machines	19%	28

	%	n
Type of mine site[1]		
Artisanal mine	67%	98
Dump site	54%	80
Industrial mine	1%	1
Type of mineral[1]		
Copper	94%	138
Cobalt	18%	27
Chromium	29%	44
Other	19%	28
Number of respondents (N)		**147**

[1] Multiple responses allowed

According to most qualitative interviewees, certain tasks are typically assigned to younger children. One interviewee explained:

> *"Young children do not do hard tasks because they see that their bodies are not yet strong, so they are assigned light jobs like guarding the things (minerals). That's all, not the task that involves carrying things."*
>
> *—ASM miner, age 17*

However, several respondents indicated that children often help move the ore. A respondent explained:

> *"So children between 12 and 17 usually ferry stone, but for me since I will be turning 18 this year so I started digging stones."*
>
> *—ASM miner, age 17*

Another interviewee who transitioned from carrying sacks to working in the pit indicated that carrying sacks is harder on the body:

> *"You go outside the pit with a 25 kg sack of soil on your head till you go down the stream and leave for those that are washing [away the soil] then you go back to ferry the sacks [again]. […] The soils are too heavy because for them they don't consider that you are a child; since you are looking for money, they will give you same quantities with adults. And now the necks pain."*
>
> *—ASM miner, age 15*

Younger children may also collect loose minerals from the ground, such as minerals exposed by rain. Digging is more often performed by older children because, according to most interviewees, it is more physically demanding.

5.3.2 Type of Mine Site

Survey respondents were also asked the type of mine site at which they worked (Table 4). Two-thirds of survey respondents worked at pit or underground mines, 54% worked at dump sites, and one respondent worked at an industrial mine site (respondents could indicate more than one type of site). Some qualitative interviewees reported previously working at dump site but losing access to that site and moving to artisanal sites.

5.3.3 Type of Minerals Mined

When asked about the type of minerals they mined, nearly all respondents (94%) reported mining copper, with a much smaller percentage mining cobalt (18%) (Table 4). Nearly one-third (29%) reported mining chromium. Qualitative respondents also mentioned mining various other minerals, including gold.

5.4 RESPONDENT PERSPECTIVES ON MINERAL SALES

Survey respondents were asked where the minerals they mined were sold. Three-fourths indicated that the minerals were sold to an intermediary, 31% to a mineral processing plant, and 5% to a large mining corporation (respondents could indicate multiple types of places) (Table 5). Eighteen percent either did not know where the minerals were sold or described a sales destination that was unclear to the interviewer. None of the 5% who indicated a large mining corporation named a specific company. For example, one respondent responded:

> *"Mostly different individuals come to buy from us just at the site, but then sometimes even companies do come to buy though they buy from the older guys not us the children."*
>
> *—ASM miner, age 13*

Most interviewees described selling to the Chinese. The 13-year-old quoted previously, when asked who buys the copper that he mines, replied:

> *"Once the copper is ready, buyers come to buy it, and we are not sure where they take it. Our supervisors are the ones who know the full story. All I know is that the Zambians who buy from us sell to the Chinese. Sometimes the Chinese come on-site to buy the copper."*
>
> *—ASM miner, age 13*

Table 5. Type of place where minerals are sold[1]

	%	n
Intermediary/middle man	75%	110
Mineral processing plant	31%	45
Large mining corporation	5%	8
Other or don't know	18%	26
Number of respondents (N)		**147**

[1] Multiple responses allowed

5.5 WORKING HOURS AND EARNINGS

5.5.1 Working Hours

One determinant of child labor, according to ILO guidelines, is whether children work above a set number of hours based on their age range. Children aged 15–17 meet the threshold of child labor if they engage in paid economic activity for 43 hours or more per week. For children aged 12–14, the threshold is 14 or more hours per week. Researchers asked respondents how many hours per week they worked in the week preceding the survey. On average, children aged 12–14 worked 40.4 hours per week (Table 6), and 74% of respondents in this age group exceeded the threshold of 14 or more hours per week. On average, children aged 15–17 worked 47 hours per week, and 49% of respondents in this age group exceeded the threshold of 43 or more hours per week.

A respondent age 13 who moves stones to the stream, washes them, and separates copper from cobalt begins working at 7 a.m. He explained that over the course of the day, he begins to get tired, but he is told to "push on" until 6 p.m., when it becomes too dark to work.

On average, those attending school worked significantly fewer hours than those not attending school. Although children attending school worked 34.7 hours per week, children not attending school worked 51 hours.

Table 6. Working hours and days

	Mean	N
Days worked per week by school attendance		
Those attending school	3.8	59
Those not attending school	4.8	88
Hours worked per day by school attendance		
Those attending school: school days	5.9	57
Those attending school: non-school days	7.9	56
Those not attending school	10.6	88
Hours worked per week by school attendance		
Those attending school	34.7	54
Those not attending school	51.0	88
Hours worked per week by age		
12–14-year-olds	40.4	46
15–17-year-olds	47.0	96
All respondents	44.8	142

5.5.2 Earnings

Survey respondents were not asked about earnings, but qualitative interviewees provided some insight into the earnings of children. Several youth interviewees mentioned being paid 50 Kwacha ($1.77) per day. Some described being paid higher rates, such as 100 Kwacha ($3.54) per day. A 17-year-old said that older children at his worksite are paid 1,500 Kwacha ($53.13) per month. A 16-year-old said that she is paid 600 Kwacha ($21.27) per month for her work washing stones.

There was universal agreement among interviewees that children are paid less than adults, even for the same work. Some interviewees described standardized pay rates, but many indicated that leaders decide on the distribution of payment after the ore has been sold. One explained:

> *"Children are not supposed to get the same amount of money as adults. When they are working they do not even know how much they will get paid. […] How much they get paid is dependent on the big people [people with high positions]."*
>
> *—ASM miner, age 17*

A 15-year-old interviewee said that he preferred working with other children rather than adults because the proceeds are shared more fairly among young people. A 16-year-old made a similar statement about preferring to work with others his age, stating that adults "bully and get our money."

5.6 EXPOSURE TO HAZARDS AND INJURIES

5.6.1 Hazards

Exposure to hazards is another determinant of child labor. Table 7 shows the hazards that were included in the survey, which were based on hazards in the ILO Model questionnaire for child labor modular surveys (International Labor Organization, 2022). The most commonly experienced hazards, all experienced by more than three-fourths of respondents, were using sharp tools (90%); carrying, pushing, or pulling heavy loads (86%); working in dust, smoke, or fumes (80%); and doing repetitive tasks (77%). Those who reported working in dust were asked the source of the dust; 56% said it came from cutting or breaking stones, and 72% said that it came from the ground (respondents could indicate more than one source). One respondent said:

> *"While in the pit, we breathe in dust, which comes from the breaking of the stones and also from the soil all around the mine site."*
>
> *—ASM miner, age 13*

Working in copper mines is linked with exposure to respirable crystalline silica, which can lead to the development of silicosis, a serious and irreversible lung disease (Nabiwa et al., 2024).

Other common hazards included working or traveling to or from work at night (73%), working at heights (62%), working underground or in tunnels (62%), working with dangerous chemicals (50%), working long hours in the hot sun without a break (50%), and working in noisy places (49%).

Table 7. Exposure to hazards[1]

	%	n
Uses sharp tools	90%	132[2]
Carries, pushes, or pulls heavy loads	86%	127
Works somewhere dust, smoke, or fumes made it hard to breathe or see	80%	117
Does the same task over and over at a fast pace for long hours	77%	113
Works or travels to or from work when it is dark	73%	108
Works up high, from where injuries could occur from a fall	62%	91
Works underground or in tunnels	56%	82
Works with liquids or powders that irritate skin, burn easily, give off vapors that smell bad or can explode	50%	73
Works long hours in the hot sun without a break	50%	73
Works in a very noisy place	49%	72
Works outdoors in very rainy or wet weather	30%	44
Uses electric or gas powered tools	14%	20[2]
Uses big or heavy machines or drives vehicles	14%	20
Works somewhere with unsafe electric wires or cables	7%	11
Number of respondents (N)		**147**

[1] Multiple responses allowed
[2] N=146 due to non-response

A 15-year-old worker provided insight into the hazards of mining in describing the process of digging a pit for ore:

> *"When we get there, we don't just dig and find minerals. We dig for some time going down till we get to a point where we find a black layer. That's when we find mineral. And where we get to find the black layer is*

deep, it can even take three days before you find this black layer. Once you find the black layer, that's when you will begin to find some minerals. I go there from Monday to Saturday, […] because what happens there is that if we don't work you may find that others have gone into the pit and they make it collapse. Now digging the pit again requires a lot of manpower. That's where we get all these injuries. You just find that there is someone in the pit, it is the reason why you hear that someone has been killed in the pit because digging the pit is frustrating. You find that you work the whole week and you haven't found any mineral."

—ASM miner, age 15

This excerpt includes two important considerations. First, digging pits is time and labor intensive. Workers, including children, may take risks because they do not want their effort to have been wasted. Second, the respondent indicates that a worker may cause a pit to collapse. He later explains that fighting may ensue as workers blame others for the loss of the shaft. Fighting with other miners is another hazard that workers face.

Several interviewees and key informants noted that mining is particularly unsafe during the rainy season when tunnels are more likely to collapse.

Although exposure to one hazard is sufficient to constitute a state of child labor by international standards, respondents experienced an average of 7.4 hazards each (Table 8), and all youth were exposed to at least one hazard. The number of hazards did not vary significantly by age group, type of mine site, or type of mineral mined. On average, boys were exposed to slightly more hazards than girls, but the small number of girls in the sample prevents drawing any conclusions from the comparison.

Table 8. Number of hazards by background and work characteristics

	Mean	N
All respondents	7.4	146
Age (years)		
12–13	7.6	23
14–15	7.1	52
16–17	7.5	71
Sex		
Male	7.5	136
Female	6.0	10
Type of mine site[1]		
Artisanal mine	7.6	97
Dump site	7.7	80
Type of mineral[1]		
Copper	7.4	137
Cobalt	8.0	27
Chromium	8.0	44

[1] Multiple responses allowed

5.6.2 Use of Personal Protective Equipment

Despite the multitude of risks mine workers are exposed to, relatively few use personal protective equipment (PPE). The most commonly used types of PPE—gloves (28%), dust masks (27%), and boots (24%)—are each only used by about one-fourth of respondents (Table 9). Only 16% of respondents reported using helmets, which is particularly concerning, given the risk of falling rocks. One respondent described:

"When working in the pit, there's a rope used to pull sacks, similar to pulling water from a well. Sometimes, as you pull, the sack can slip and drop. If those working below aren't careful, they might fall with the sack. The falling sack can hit someone, causing them to lose balance and fall. Additionally, small stones or rocks can cause injuries. For instance, if there's a hard rock in the well that was left with sharp edges, the rope or sack brushing against it can dislodge the rock, causing it to fall. These accidents are common."

—ASM miner, adult

Table 9. Use of PPE[1]

	%	n
Gloves	28%	41
Dust mask	27%	40
Boots	24%	35
Coveralls	16%	24
Helmet	16%	23
Goggles	12%	18
Number of respondents (N)		**147**

[1] Multiple responses allowed

5.6.3 Work-related Injuries

Injuries due to mining work were common among survey respondents. As shown in Table 10, two-thirds of respondents (67%) reported having been hurt or injured on the job. Among those hurt or injured, 39% needed to seek treatment at a health clinic or post, and 24% needed to seek treatment at a hospital. For example, a 12-year-old described dropping a sack of stones on his feet. He was taken to the clinic but lied about the source of his injury, stating that it was from a bicycle accident.

Qualitative interviewees reported that no first aid or health care is available at worksites. When a worker, whether an adult or a child, is injured, his coworkers will transport him to his family or a health facility for care. A female mine worker who works with her three eldest children, stated that she has seen children become injured and even die from mine work. When asked who helps injured children, she replied:

"They are helped by those people who usually come to the mine [other mine workers]. We then get the child and take them to the clinic. Sometimes you find that they even remain with a disability after they get injured. It's very sad."

—ASM miner, adult

Table 10. Injuries and illnesses

	%	n	N
Ever hurt or injured by work in mining	67%	99	147
Needed to seek treatment[1]			
At clinic or health post	39%	39	99
At hospital	24%	24	99

[1] Multiple responses allowed

Several interviewees described injuries from tools like hammers or chisels slipping and hitting the body. When asked when any of his friends had been hurt at work, an interviewee said:

"Someone got into the mine without protective equipment, and he was chiseling stones. While working, the tool slipped off his hand and hit him on his leg and started bleeding. Then the supervisor rushed him to the hospital, and since then he hasn't come back."

—ASM miner, age 17

Many interviewees shared instances of serious injury and death. When asked whether he has ever seen children get injured doing mining work, a 17-year-old miner responded:

> *"Yes, I have. When digging and you cannot find the target, we continue digging and pile that dirt. If the digging is not properly done, it falls off. I have seen people get buried by the same dirt that falls off. […Then] they start digging with an excavator, and sometimes a person might be alive, but the excavator might pierce them when digging in trying to retrieve people."*
>
> *—ASM miner, age 17*

A 15-year-old respondent told of being buried during a tunnel collapse. He described being blocked in after rocks came loose and blocked the entrance of the tunnel. Other people died during the same accident, and his own parents initially believed him dead.

A 13-year-old respondent described the recent death of a worker:

> *"So there are times that if that person at the bottom didn't tie [the sack of stones] properly, you find that it will become loose and hit him. […] He tied [improperly], and instead of coming out he remained in there. […] He didn't tie properly, then it became loose and hit him."*
>
> *—ASM miner, age 13*

5.7 EMPLOYMENT CHARACTERISTICS

5.7.1 Whether Given Instructions at Work

Most respondents (80%) indicated that someone tells them what to do when they are doing mining activities (Table 11). For example, one interviewee said:

> *"The adults who pick us from home are the ones who give us instructions at work on what to do. […] They are not my relatives, but just friends."*
>
> *—ASM miner, age 13*

Among workers who are instructed by someone else, 21% reported that their boss is a member of their family. One qualitative interviewee described working for his older brother, and an adult qualitative interviewee described working with the assistance of his 16-year-old son.

Table 11. Employment characteristics

	%	n	N
Works under the direction of someone else[1]	80%	117	147
Boss is member of respondent's family	21%	24	117
Respondent has been punished for mistakes at work	40%	47	117
Boss would not let respondent stop working if respondent wanted to	34%	40	117

[1] Question text: Does someone tell you what to do when you're doing mining activities?

5.7.2 Punishment and Coercion

Forty percent of workers who work under the direction of someone else reported having been punished for mistakes at work. Youth qualitative interviewees described being spoken to harshly after making mistakes or working too slowly, and several mentioned threats against their pay.

For example, a 12-year-old explained that when the adults go in the tunnel and get the minerals, he helps pull out the ore. He said that pulling ore "drains your energy so you end up getting tired fast." His employers constantly urge him to work faster, saying, "Work fast, or you won't get paid if you don't keep up."

Another child recalled being told that if he did not meet his employer's expectations, he would not receive his payment on time, and a different child described being threatened with not being paid at all.

Robyn (not her real name), an adolescent who was brought from another town to the mine site and lives in housing provided by her employer, was asked what would happen if she made a mistake:

> *"They usually get upset when you make a mistake to the extent that sometimes they even reach to an extent of telling you to go back where they got you from. They will tell you to look for your own transport money to go back."*
>
> *[Interviewer: Do they punish you?]*
>
> *"The only punishment which they give is that they will not give you food."*
>
> *—ASM miner, adolescent*

Respondents described physical violence:

> *"When you make a mistake, like you digging, like you get a mineral which they can't buy and put in the sack [and the owner] sees, he will ask to say who is in front [meaning the front of the line of miners hauling out the sacks and therefore the one who loaded the sack]? When he comes out, they beat you badly. They will ask him to choose between being beaten or punished. If he chooses to be punished, then he will go in the tunnel even for a month or two months in the tunnel."*
>
> *—ASM miner, age 13*

> *"I once saw a child who had been beaten, and when I asked why, I was told it was because he had refused to enter the tunnel. They justified it by saying the child had eaten food they had bought and then refused to work."*
>
> *—ASM miner, adult*

5.7.3 Ability to Quit

One-third (34%) of survey respondents working under the direction of someone else reported that this person would not let them stop this work if they wanted. Youth qualitative interviewees were not systematically asked about being able to stop working, and apart from Michael on his first day (see box on page 34), none mentioned being unable to stop working. Most adult qualitative interviewees indicated that children work voluntarily and can quit if they choose to do so.

However, a few respondents indicated that there may be challenges to quitting. One said that he has seen some "run away because the job is hard." When asked whether a child can stop working, he said:

> *"No, they cannot choose to stop. What they can do is just make a decision to never come back the following day when they knock off if they feel they cannot manage to work, but they are not forced to continue*

coming and working. […] There is always a challenge working with the commanders, so when you feel mistreated, and you cannot speak out because you may be beaten, so it is better to just leave and never come back the following day."

—ASM miner, age 17

5.7.4 Migration for Work

A few interviewees mentioned that workers from neighboring countries, primarily the DRC, are sometimes found working in area mines. The interviewees indicated that these miners are adults or, less commonly, families. None described children moving alone or in groups without their parents. Several mentioned that locals attempt to prevent workers from other countries from mining in their communities.

Several interviewees responded in the affirmative when asked whether street children from other locations ever work in mining. One said:

"Yes, there are times when we have a lot of work and a shortage of manpower, it is during such moments that we follow the street kids to help us with the production of copper."

[Interviewer: When they work in the mine, who agrees that they can work?]

"The top leadership that we work for and provide the material for are the ones who groups us."

—ASM miner, adult

The respondent also stated that the children are not forced to work and that they get paid.

Another interviewee, a 22-year-old miner, stated:

"That only happens when we are dealing with low grade. […] If I need people to help with gathering the mineral in situations where I need to fill one or two Sino trucks that before selling, that is when that can happen. We have single stance trucks with just one tire in the middle and double stance which has two plus the middle tire, and for the low grade copper, the percentage of the copper concentrate found in it is low so those who buy get to buy in bulk, so we have to gather a lot and then load it and sell it, hence, the need to bring in people from other far places to do the work. On the other hand, high grade does not need a lot of manpower, even two people can do the work."

—ASM miner, adult

This respondent also stated that children are not forced and that if they come to the mine it is because "they know what they want [to do]."

Robyn, the adolescent mentioned previously, described being transported to work in mining. She explained that after the death of her parents, she had no one to support her. People came to her town looking for people who wanted piece work, and they brought her from her town to the mining site where she works (more than 100 miles [150 kilometers] from her original town). Robyn lives in a house provided by her employer with other workers from her town. She works with other children, some as young as age 11, washing stones brought from the mine.

5.8 ROLE OF JERABOS

According to media reports, some illegal mining operations are controlled by gangs, members of which are called "jerabos" (Africa Confidential, 2020; Focus260, 2022; Shalala, 2018). Reports indicate that jerabo leaders are visibly wealthy, driving very expensive cars, for example, and this wealth attracts

young followers. Some of these followers are youth under age 18 who participate in mining operations controlled by jerabo leaders. According to newspaper reports, an informant from a community organization has alleged that jerabos forcibly coerce street children to work in mining operations (Mweetwa, 2023). The informant indicated that jerabos prefer to engage children for work in tunnels because of their small size and later specified that children "as young as 14" are used for these tasks. These children are said to live in fear because they have been threatened by jerabos.

This study sought to expand the knowledge available on jerabos in copper mining; however, due to safety concerns, researchers were limited in the questions they could ask (see *Section 3.5, Limitations and Challenges*).

Adult qualitative interviewees were asked about the role of jerabos in mining. A 22-year-old who was asked to explain about jerabos replied:

> *"Jerabos are people like those (big guys) in the pits. [...] Jerabos are senior youths who don't have what to do, and they go in the pits."*
>
> *—ASM miner, adult*

Another 22-year-old miner, when asked about the role of jerabos in mining, responded:

> *"Anyone who deals with this is categorized as a jerabos."*
>
> *[Interviewer: So, you are a Jerabo?]*
>
> *"Yes, even you if you worked in the mine you become one, and generally that is how this society looks at this issue. Like I mentioned, it revolves around protocols, the top leaders are known and you need to have meetings with them to discuss future work sites and jobs. […] The top jerabos are the ones who are more involved with the trucks, they are the ones who look for opportunities for work, so once they find the opportunities and it is official, they are the ones who organize the trucks to be used for loading and extend the opportunities to the community by employing people to work with them by loading the trucks, selling to the Chinese people, and then they pay them their dues."*
>
> *—ASM miner, adult*

Several other adult qualitative interviewees self-identified as jerabos and seemed to view the term as interchangeable with informal miner. A young adult was asked what he knows about jerabos, and he indicated that jerabos are people who had planned for other jobs but found them unable to obtain. He said:

> *"Jerabos—it's just us, isn't it? It's us. While we are educated, the reality of life is often different from what we imagined when we were still in school."*
>
> *—ASM miner, adult*

Only one respondent, an adult miner who did not identify as a jerabo, linked jerabos with child labor:

> *"They [children] have their own bosses who supervise them. They are the ones who cause them to go there. It is not the parents who advise; no, it is these same illegal miners, these jerabos."*
>
> *—ASM miner, adult (age unknown)*

5.9 CHILD LABOR

All 147 children surveyed in this study met the criteria for child labor under international standards. Although working hours alone would classify 75% of children aged 12–14 and 49% of those aged 15–17

as being in child labor, the universal exposure to hazardous working conditions means that every child surveyed was engaged in child labor according to international standards.

Zambia's Employment Code (2019) prohibits children under age 15 from participating in industrial activities, including mining.

Children aged 15–17 may legally work in mining under specific conditions—either with an apprenticeship contract or with a certificate signed by an authorized officer—but most surveyed children lacked these legal protections. Only 20 of the 97 respondents aged 15–17 had apprenticeship contracts, and none possessed the required work certificates.

Therefore, 86% of all respondents (100% of those under age 15 and 79% of those aged 15–17) were found to be in working arrangements that violate Zambian labor and child safety laws.

6 CONCLUSION AND RECOMMENDATIONS

This study provides comprehensive evidence on the presence of child labor in Zambia's copper and cobalt supply chains and maps the complex pathways through which minerals move from extraction to export. The findings reveal significant challenges in ensuring responsible sourcing from Zambia due to the widespread co-mingling of formally and informally produced materials throughout the supply chain.

All 147 children surveyed qualified as being in child labor according to international standards, primarily due to their engagement in hazardous work. Children are involved in various mining activities, including moving ore, digging, and buying or selling minerals. They face numerous hazards—averaging 7.4 hazards per child—and two-thirds reported work-related injuries. The majority of these children (60%) do not attend school, and most have fallen behind in their education by an average of 2.7 years.

The study identified three critical points in the supply chain at which formally and informally produced materials become co-mingled: licensed traders who purchase from informal sources and legitimize materials through tax payments, Chinese-owned processing facilities that accept and aggregate material from various sources, and smelting operations that blend concentrates from different origins for technical reasons. This systematic co-mingling means that once materials have been processed, particularly after smelting, it becomes virtually impossible to determine their original source with current systems.

The domestic supply chains of copper and cobalt in Zambia are characterized by a dual structure of LSM operations and ASM activities. While LSM is dominated by multinational corporations using sophisticated technology, ASM operations employ labor-intensive methods with minimal equipment and often operate in legal gray areas. Under Zambia's legal framework, specific categories of mining licenses are reserved for citizens, but enforcement challenges and economic pressures have resulted in widespread informal mining activities.

Zambia exports approximately 90% of its copper production, mostly in the form of unrefined copper anodes and refined but unwrought copper alloys. Nearly two-thirds (61.3%) of all Zambian exports of copper ultimately went to China, and just over a quarter (27.7%) ultimately went to India. Nearly all cobalt production is exported, with 97.9% going to South Africa as cobalt oxides and hydroxides.

The presence of child labor in the extraction phase, combined with extensive co-mingling throughout the supply chains, leads to the conclusion that all copper produced in Zambia—and the cobalt present as a byproduct of copper mining—carries the risk of association with child labor. Despite government efforts to formalize mining activities through permitting systems and regulatory frameworks, the integration of ASM material into formal supply

chains remains systematic and widespread, creating significant challenges for downstream buyers seeking to ensure responsible sourcing.

Addressing these challenges requires a multi-faceted approach involving all stakeholders in the supply chain. Private sector actors need to implement targeted due diligence at key co-mingling points and develop technical solutions to the blending requirements that currently obscure mineral origins. The Zambian government should reform the mineral trading permit system to close loopholes that enable the "laundering" of informally mined materials and strengthen the regulation of processing facilities where co-mingling occurs. Foreign governments can play a role by supporting traceable material streams and working with Swiss commodities traders who serve as intermediaries for much of Zambia's copper exports. Civil society organizations can contribute by monitoring key supply chain junctures and addressing the exploitation of child workers.

Ultimately, sustainable solutions must address both the supply chain vulnerabilities that enable child labor and the socioeconomic factors that drive children to work in dangerous mining conditions. This includes creating economic alternatives for families, improving access to education, addressing safety hazards at mining sites, and developing mechanisms to protect children, particularly those transported from other regions to work in mines.

By implementing these recommendations, stakeholders can work toward more transparent, traceable, and responsible copper and cobalt supply chains in Zambia, which protect children's rights, provide sustainable livelihoods for mining communities, and meet the global demand for these critical minerals.

6.1 RECOMMENDATIONS

Recommendations to Improve Supply Chain Transparency and Reduce Child Labor

Recommendations for Private Sector Actors:

- **Implement robust due diligence systems.** These systems should go beyond first-tier suppliers to include all stages of the supply chain, focusing in particular on major co-mingling points identified in this report, such as licensed traders who purchase from informal sources, Chinese-owned processing facilities that accept material from multiple sources, and smelting operations that blend concentrates from different origins.
- **Support formalization of ASM operations** through financial and technical assistance programs that help miners obtain proper licensing, access financing, improve their operational practices, and establish direct sourcing relationships with formalized ASM operations to reduce reliance on traders and middlemen, where significant co-mingling occurs.
- **Conduct regular third-party audits** of suppliers and processing facilities, with special attention to high-risk points of co-mingling identified in the supply chain, such as Chinese-owned processing facilities.
- **Invest in community development programs** in mining areas, with a focus on education, alternative livelihoods, and social services that address the root causes of child labor.

Recommendations for the Government of Zambia:

- **Strengthen enforcement of the Minerals Regulation Commission Act** by increasing monitoring capacity for ASM operations and enhancing penalties for non-compliance with licensing requirements.

- **Regulate Chinese-owned processing facilities.** Strengthen oversight of the numerous Chinese-owned facilities throughout the Copperbelt that serve as key intermediaries between informal miners and formal markets, requiring them to implement stricter sourcing controls.
- **Reform the mineral trading permit system** to close loopholes that currently allow for the "laundering" of informally mined materials through tax payments, implementing stricter verification requirements for mineral origin.
- **Establish designated trading centers** for ASM copper and cobalt with standardized pricing, testing facilities, and transparent documentation, reducing the influence of informal traders.
- **Increase support for ASM formalization** by simplifying licensing procedures, reducing fees, providing technical training, and creating incentives for compliance.
- **Strengthen child labor monitoring systems** at mining sites, with regular inspections and coordination between mining and labor authorities to ensure enforcement of child labor prohibitions.
- **Improve tracking of school attendance** of children in communities near mining areas and provide resources or other incentives to families to keep children in school (e.g., small financial incentives funded by the proceeds of copper exports).
- **Introduce educational curriculum and awareness campaigns** about the dangers of child labor in mine work at schools and communities near mining sites.

Recommendations for Other Governments:

- **Expand technical assistance** to the Zambian government for implementing supply chain traceability systems and strengthening enforcement capacity for mining regulations. Provide funding and technical assistance to Zambian government or non-governmental organization efforts targeted toward addressing hazardous child labor, supporting accident prevention and response in ASM, and addressing educational barriers and supporting livelihood diversification in mining communities.
- **Focus trade enforcement of labor standard requirements on Swiss commodities traders.** Switzerland is the dominant commodity trader of copper exports from Zambia. Zambian export records indicate that Switzerland is the importer of record for 62% of copper export value. However, the vast majority of this copper is traded during shipment, and the actual physical destination markets for these exports are primarily China and India. Work with Swiss authorities to improve transparency and accountability for labor standards in commodities trading.
- **Support traceable material streams.** Fund pilot projects that establish verifiable chains of custody from mine to market, specifically addressing the technical challenges of maintaining separation through the three identified co-mingling points: licensed traders who purchase from informal sources and formalize material trade through tax payments, Chinese-owned processing facilities that accept and aggregate material from various sources, and smelting operations that blend concentrates from different origins for technical reasons. Incentivize responsible sourcing through preferential trade status for verified responsible suppliers and public recognition for companies implementing best practices.

Recommendations for Civil Society Organizations:

- **Partner with private sector actors** to design and implement community development initiatives in mining areas that create alternative livelihood opportunities and improve access to basic services.
- **Monitor key supply chain junctures.** Conduct independent monitoring operations, focusing in particular on the specific points at which formally and informally produced materials become

co-mingled, identified in this report. Publish findings to enhance transparency and accountability in the sector.

- **Support community-based monitoring systems** that empower local stakeholders to identify and report child labor and other violations in mining operations.
- **Provide technical assistance to ASM operators** on formalization procedures, environmental management, safety practices, and regulatory compliance.
- **Advocate for policy reforms** that address structural issues in the mining sector, including fair pricing mechanisms, transparent revenue management, and equitable distribution of benefits from mineral extraction.

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APPENDIX 2: HS CODES

HS Code Glossary

Product (general)	Product (specific)	HS code	HS definition
Cobalt	Cobalt ores and concentrates	2605	Cobalt ores and concentrates
	Cobalt oxides and hydroxides	2822	Cobalt oxides and hydroxides; commercial cobalt oxides
	Cobalt sulfates	2833.29	Sulphates; alums; peroxosulphates (persulphates). Other sulphates: Other
	Cobalt carbonates	2836.99	Carbonates; peroxocarbonates (percarbonates); commercial ammonium carbonate containing ammonium carbamate. Other: Other
	Cobalt acetates	2915.29	Saturated acyclic monocarboxylic acids and their anhydrides, halides, peroxide and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives. Acetic acid and its salts; acetic anhydride: Other
	Cobalt mattes and intermediate products of cobalt metallurgy, unwrought cobalt, and cobalt powder	8105.20	Cobalt mattes and other intermediate products of cobalt metallurgy; unwrought cobalt; powders
	Cobalt (other)	8105.90	Cobalt mattes and other intermediate products of cobalt metallurgy; cobalt and articles thereof, including waste and scrap. Other
Copper	Copper ores and concentrates	2603	Copper ores and concentrates, copper content
	Copper oxides and hydroxides	2825.50	Copper oxides and hydroxides:
	Phosphides of copper	2853.90.10	Phosphides of copper (phosphor copper), containing more than 15% by weight of phosphorous
	Copper mattes	7401	Copper mattes; cement copper (precipitated copper)
	Unrefined copper; copper anodes for electrolytic refining	7402	Unrefined copper; copper anodes for electrolytic refining
	Refined copper and copper alloys, unwrought (other than master alloys of heading 7405)	7403	Refined copper and copper alloys, unwrought (other than master alloys of heading 7405)
	Copper waste and scrap	7404	Copper waste and scrap
	Copper bars, rods, and profiles	7407	Copper bars, rods and profiles

Notes on HS mapping:
Data reported by Zambia on its cobalt and copper exports do not always match data reported by importing countries. The table above lists all cobalt and copper exports reported by Zambia (including some negligible imports, such as "cobalt acetates" [$9] and "cobalt; other" [$10]), plus any reported imports valued at more than $1 million USD, even if they do not appear among Zambia's reported exports (UN Comtrade, 2025).

APPENDIX 3: EXPORTS

Top 5 importers for copper from Zambia, 2023, as reported by Zambia (exporting country)

Destination country	Trade value	% of total copper export value from Zambia
Switzerland	$4,160,051,511	62.0%
China	$1,791,896,146	26.7%
Singapore	$557,309,970	8.3%
Hong Kong	$90,035,574	1.3%
United States	$37,763,743	0.6%

Source: UN Comtrade, 2024. HS codes: 2603, 2825.50, 2833.25, 2853.90, 7401, 7402, 7403, 7404, 7405, 7406, 7407

Top 5 importers for copper from Zambia, 2023, as reported by importing countries

Destination country	Trade value	% of total copper import value from Zambia
China	$4,100,276,895	59.2%
India	$1,852,808,358	26.8%
Canada	$180,135,269	2.6%
Egypt	$142,840,290	2.1%
South Africa	$105,854,238	1.5%

Source: UN Comtrade, 2024. HS codes: 2603, 2825.50, 2833.25, 2853.90, 7401, 7402, 7403, 7404, 7405, 7406, 7407

Top 5 importers for cobalt from Zambia, 2023, as reported by Zambia (exporting country)

Destination country	Trade value	% of total cobalt export value from Zambia
South Africa	$47,086,489	97.9%
Dem. Rep. of the Congo	$458,223	1.0%
Mauritius	$323,304	0.7%
United Rep. of Tanzania	$220,574	0.5%
United Arab Emirates	$10	0.0%

Source: UN Comtrade, 2024. HS codes: 2605, 2822, 2827.39, 2833.29, 2836.99, 2915,29, 8105.2, 8105.3, 8105.9

Top 5 importers for cobalt from Zambia, 2023, as reported by importing countries

Destination country	Trade value	% of total cobalt import value from Zambia
USA	$2,134,777	27.5%
China	$1,845,202	23.8%
Namibia	$1,486,204	19.2%
Japan	$1,071,113	13.8%
United Kingdom	$476,882	6.1%

Source: UN Comtrade, 2024. HS codes: 2605, 2822, 2827.39, 2833.29, 2836.99, 2915,29, 8105.2, 8105.3, 8105.9

Top global exporters of copper, 2023

Exporting country	Trade value	% of global total
Chile	$87,326,205,574.52	21.3%
Peru	$46,253,887,976.22	11.3%
Dem. Rep. of the Congo	$41,207,765,789.39	10.0%
USA	$20,241,577,022.00	4.9%
Japan	$17,931,689,778.93	4.4%

Source: UN Comtrade, 2024. HS codes: 2603, 2825.50, 2833.25, 2853.90, 7401, 7402, 7403, 7404, 7405, 7406, 7407

Top global exporters of cobalt, 2023

Exporting country	Trade value	% of global total
Dem. Rep. of the Congo	$4,832,978,350	10.0%
China	$1,171,910,597	6.4%
Chile	$745,697,678	5.4%
Germany	$634,280,352	5.4%
USA	$628,524,621	5.4%

Source: UN Comtrade, 2024; HS codes: 2605, 2822, 2827.39, 2833.29, 2836.99, 2915,29, 8105.2, 8105.3, 8105.9

Exports of copper from Zambia, by HS code, value, 2019–2023, as reported by Zambia

Good	HS code	2019	2020	2021	2022	2023	Top importers of record for 2023 (percentage)
Copper ores and concentrates	2603	$1,832,361	$193,714,446	$40,837,010	$109,300,755	$39.854,049	China (52.7%)
Copper oxides and hydroxides	2825.50	$5,206,971	$167,530	$0	$56,402	$93	India (75.3%)
Phosphides	2853.90	$0	$19	$2,005	$263	$4	Tanzania (100%)
Copper mattes	7401	$0	$0	$4	$0	$0	N/A*
Unrefined copper	7402	$3,766,275,752	$4,253,758,496	$6,112,586,054	$6,131,039,303	$5,030,931,524	Switzerland (62.3%)**
Refined copper, unwrought	7403	$1,130,590,066	$1,449,359,936	$2,127,491,244	$1,885,800,031	$1,630,428,004	Switzerland (62.5%)**
Copper waste and scrap	7404	$836	$5	$0	$1,812	$0	N/A***
Copper bars, rods, & profiles	7407	$276,126	$178,367	$0	$1,181,127	$584,614	China (53.4%)

Source: UN Comtrade, 2024

*Although Zambia shows insignificant exports of copper mattes over the last five years, and no exports in 2023, import data show that South Korea imported $12,575,340 (96.7%) of copper mattes from Zambia in 2023 (UN Comtrade, 2025)

**Although Zambia records Switzerland as the top destination for both unrefined copper and unwrought refined copper, import records show China to import the greatest amounts of both of these products (64% and 40.7%, respectively).

***Although Zambia shows insignificant exports of copper waste and scrap over the last 5 years, and no exports in 2023, import data show that South Africa imported $2,771,770 (72.6%) of copper waste and scrap from Zambia in 2023 (UN Comtrade, 2025).

Exports of cobalt from Zambia, by HS code, value, 2019–2023, as reported by Zambia

Good	HS code	2019	2020	2021	2022	2023	Top importers of record for 2023 (percentage)
Cobalt ores and concentrates	2605	$161,367	$192,786	$69,820	$237,266	$323,312	Mauritius (100%)
Cobalt oxides and hydroxides	2822	$0	$0	$338,132	$82,805,714	$47,086,480	South Africa (100%)
Sulphates	2833.29	$1,442,132	$222,823	$489,097	$1,958,948	$458,223	Dem. Rep. of Congo (100%)
Carbonates	2836.99	$0	$0	$78,167	$264,266	$220,574	Tanzania (100%)
Acids	2915.29	$15,344	$3,744	$0	$1,979	$9	Andorra (100%)
Cobalt mattes	8105.20	$0	$1,772	$0	$0	$0	N/A*
Cobalt (other)	8105.90	$45,742,613	$10,392,893	$4,885,896	$0	$10	United Arab Emirates (100%)

Source: UN Comtrade, 2024

* Although Zambia shows insignificant exports of cobalt mattes over the last 5 years, and no exports in 2023, import data show that the United States imported $2,134,777 (38.4%) of copper mattes from Zambia in 2023 (UN Comtrade, 2025).

APPENDIX 4: DEFINING CHILD LABOR

Child Labor: "Child labor is defined by ILO Conventions 138 on the Minimum Age for Admission to Employment and 182 on the Worst Forms of Child Labor. It includes employment below the minimum age as established in national legislation, hazardous unpaid household services, and the worst forms of child labor: all forms of slavery or practices similar to slavery, such as the sale or trafficking of children, debt bondage and serfdom, or forced or compulsory labor; the use, procuring or offering of a child for prostitution, for the production of pornography or for pornographic purposes; the use, procuring or offering of a child for illicit activities; and work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children." (ILO, 1973; USDOL, n.d.)

Child Labor Conventions: The ILO Convention on Child Labor, 1973 (No. 138) aims to abolish child labor by requiring countries to establish a minimum age for work as well as employment (typically 14–15 years of age) while also allowing for light work for children under that age (ILO, 1973). The convention also requires nations to establish policies to eliminate child labor. In Article 3, the convention defines the "minimum age for admission to any type of employment or work which by its nature or the circumstances in which it is carried out is likely to jeopardize the health, safety or morals of a young person" to be 18 years old. The ILO Worst Forms of Child Labor Convention, 1999 (No. 182) (ILO, 1999a) defines the worst forms of child labor as:

- All forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom and forced or compulsory labor, including forced or compulsory recruitment of children for use in armed conflict
- The use, procuring, or offering of a child for prostitution, for the production of pornography, or for pornographic performances
- The use, procuring, or offering of a child for illicit activities, in particular for the production and trafficking of drugs, as defined in the relevant international treaties
- Work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children (hazardous child labor)

Hazardous child labor is then further defined in Article 3 of the ILO Worst Forms of Child Labor Recommendations, 1999 (R190) (ILO, 1999b) as:

- Work which exposes children to physical, psychological, or sexual abuse
- Work underground, under water, at dangerous heights, or in confined spaces
- Work with dangerous machinery, equipment and tools, or which involves the manual handling or transport of heavy loads
- Work in unhealthy conditions that may expose children to hazardous substances, harmful agents, dangerous processes, or damaging levels of temperature, noise, or vibrations
- Work under particularly difficult conditions such as working for long hours or during the night or work where the child is unreasonably confined to the premises of the employer

APPENDIX 5: FINAL RESEARCH INSTRUMENTS

WORKERS' QUESTIONNAIRE

Relevance criteria	Question number	Question and response options
		SECTION 1: GENERAL INFO
	S1Q1	INTERVIEWER: RECORD SEX 1. MALE 2. FEMALE
	S1Q2	Have you ever been to school? 1. YES 2. NO 77. DK 99. REFUSED
ASK IF EVER ATTENDED SCHOOL	S1Q2A	What's the highest grade you have completed? 0. Preschool 1. 1 2. 2 3. 3 4. 4 5. 5 6. 6 7. 7 8. 8 9. 9 10. 10 11. 11 12. 12 77. DK 99. REFUSED
ASK IF EVER ATTENDED SCHOOL	S1Q2B	Did you attend school last week? 1. YES 2. NO 77. DK 99. REFUSED
	S1Q3	Now I'd like to ask about other activities you may do. Have you done any mining activities in the past week? 1. Yes 2. No à END INTERVIEW
	S1Q3A	I'm going to read out some activities. Please tell me which ones did in the past week. Did you… …crush rocks? 1. YES 2. NO

Relevance criteria	Question number	Question and response options
		77. DK 99. REFUSED
	S1Q3B	… dig for ore using machines? 1. YES 2. NO 77. DK 99. REFUSED
	S1Q3C	…dig for ore without machines? 1. YES 2. NO 77. DK 99. REFUSED
	S1Q3D	…wash copper material? 1. YES 2. NO 77. DK 99. REFUSED
	S1Q3E	…buy or sell ore? 1. YES 2. NO 77. DK 99. REFUSED
	S1Q3F	…move ore within the site or outside the mine? 1. YES 2. NO 77. DK 99. REFUSED
	S1Q3G	…do anything else related to mining? 1. YES 2. NO 77. DK 99. REFUSED
ASK IF OTHER	S1Q3_OTHER	What other mining activities did you do? TEXT
IF DID NOT ATTEND SCHOOL PREVIOUS WEEK	S1Q4	Since last [INSERT DAY OF WEEK], how many days did you do mining activities? 1. 1 2. 2 3. 3 4. 4 5. 5 6. 6 7. 7 77. DK 99. REFUSED

Relevance criteria	Question number	Question and response options
IF DID NOT ATTEND SCHOOL PREVIOUS WEEK	S1Q4B	On days that you did mining activities, what time did you usually start doing them? INTERVIEWER: ROUND TO CLOSEST HOUR. EXCLUDE TIME SPENT TRAVELING TO WORK.
IF DID NOT ATTEND SCHOOL PREVIOUS WEEK	S1Q4C	What time did you usually stop? INTERVIEWER: ROUND TO CLOSEST HOUR. EXCLUDE TIME SPENT TRAVELING FROM WORK.
IF DID NOT ATTEND SCHOOL PREVIOUS WEEK	S1Q4D	So you worked about [FILL NUMBER] hours. Is that right? INTERVIEWER: GO BACK AND CORRECT IF NOT RIGHT
IF DID NOT ATTEND SCHOOL PREVIOUS WEEK AND DON'T KNOW TO HOURS QUESTION	S1Q4E	On days that you work, about how much of the day do you spend working? 1. 1-4 HOURS 2. 5-8 HOURS 3. 9-12 HOURS 4. MORE THAN 12 HOURS 77. DON'T KNOW 99. REFUSED INTERVIEWER: DO NOT READ RESPONSES ALOUD. WORK WITH THE RESPONDENT TO GET AN APPROXIMATION (ALL DAY = 8 HOURS, HALF THE DAY = 4 HOURS)
IF DID ATTEND SCHOOL PREVIOUS WEEK	S1Q5	Since last [INSERT DAY OF WEEK], how many days did you do mining activities AND attend school? 0. 0 1. 1 2. 2 3. 3 4. 4 5. 5 77. DK 99. REFUSED
IF DID ATTEND SCHOOL PREVIOUS WEEK	S1Q5A	Since last [INSERT DAY OF WEEK], how many non-school days did you do mining activities? 0. 0 1. 1 2. 2 3. 3 4. 4 5. 5

Relevance criteria	Question number	Question and response options
		6. 6 7. 7 77. DK 99. REFUSED INTERVIEWER: INCLUDE DAYS WHEN SCHOOL WAS OPEN BUT RESPONDENT DID NOT ATTEND
IF MINED SCHOOL DAYS	S1Q5B	On days that you had school, what time did you usually start doing mining activities? INTERVIEWER: ROUND TO CLOSEST HOUR. EXCLUDE TIME SPENT TRAVELING TO WORK.
IF MINED SCHOOL DAYS	S1Q5C	What time did you usually stop? INTERVIEWER: ROUND TO CLOSEST HOUR. EXCLUDE TIME SPENT TRAVELING FROM WORK.
IF MINED SCHOOL DAYS	S1Q5D	So you worked about [FILL NUMBER] hours on school days. Is that right? INTERVIEWER: GO BACK AND CORRECT IF NOT RIGHT
IF MINED SCHOOL DAYS AND DON'T KNOW TO HOURS QUESTION	S1Q5E	On school days that you work, about how much of the day do you spend working? 1. 1-4 HOURS 2. 5-8 HOURS 3. 9-12 HOURS 4. MORE THAN 12 HOURS 77. DON'T KNOW 99. REFUSED INTERVIEWER: DO NOT READ RESPONSES ALOUD. WORK WITH THE RESPONDENT TO GET AN APPROXIMATION (ALL DAY = 8 HOURS, HALF THE DAY = 4 HOURS)
IF MINED NON SCHOOL DAYS	S1Q6B	On days that you did not go to school, what time did you usually start doing mining activities? INTERVIEWER: ROUND TO CLOSEST HOUR. EXCLUDE TIME SPENT TRAVELING.
IF MINED NON SCHOOL DAYS	S1Q6C	What time did you usually stop? INTERVIEWER: ROUND TO CLOSEST HOUR. EXCLUDE TIME SPENT TRAVELING.

Relevance criteria	Question number	Question and response options
IF MINED NON SCHOOL DAYS	S1Q6D	So you worked about [FILL NUMBER] hours on days you didn't go to school. Is that right? INTERVIEWER: GO BACK AND CORRECT IF NOT RIGHT
IF MINED SCHOOL DAYS AND DON'T KNOW TO HOURS QUESTION	S1Q6E	On days that you worked and you didn't go to school, about how much of the day do you spend working? 1. 1-4 HOURS 2. 5-8 HOURS 3. 9-12 HOURS 4. MORE THAN 12 HOURS 77. DON'T KNOW 99. REFUSED INTERVIEWER: DO NOT READ RESPONSES ALOUD. WORK WITH THE RESPONDENT TO GET AN APPROXIMATION (ALL DAY = 8 HOURS, HALF THE DAY = 4 HOURS)
	READ	In the rest of the questions I will ask you, please think about your work in the copper mining sector.
IF AGE 15+	S1Q7	Are you employed under an apprenticeship contract? 1. YES 2. NO 77. DK 99. REFUSED
IF AGE 15+	S1Q7A	Do you have a certificate from the district labour office that permits you to work? 1. YES 2. NO 77. DK 99. REFUSED
IF YES, HAS CERTIFICATE	S1Q7B	What was the process for getting the certificate? What kind of work does it allow? TEXT 77. DK 99. REFUSED INTERVIEWER: PROBE FOR CONDITIONS REQUIRED TO GET THE CERTIFICATE.
	S1Q8	Which of these photos looks most like the place you worked in the past week? [DISPLAY PHOTOS OF TYPES OF SITES] 1. INDUSTRIAL MINE

Relevance criteria	Question number	Question and response options
		2. ARTISANAL MINE WITH MINE WELL 3. DUMP SITE 55. OTHER 77. DON'T KNOW 99. REFUSED PROGRAMMER: SELECT MULTIPLE
IF OTHER	S1Q8_OTHER	SPECIFY OTHER
	S1Q9	Which of these minerals have you mined in the last week? [DISPLAY PHOTOS OF MINERALS] 1. COPPER 2. COBALT 3. CHROMIUM 55. OTHER 77. DON'T KNOW 99. REFUSED PROGRAMMER: SELECT MULTIPLE
IF OTHER	S1Q9_OTHER	SPECIFY OTHER
		SECTION 2: EXPOSURE
	S2Q1	Which of these items do you usually wear when working? [DISPLAY PHOTOS OF GEAR] 1. HELMET 2. GOGGLES 3. DUST MASK 4. COVERALLS 5. BOOTS 6. GLOVES 55. OTHER 66. NONE 77. DON'T KNOW 99. REFUSED PROGRAMMER: SELECT MULTIPLE
	S2Q2	Thinking about the work you did during the past week, did you… ….carry, push, or pull heavy loads? 1. Yes 2. No

Relevance criteria	Question number	Question and response options
	S2Q2A	… work up high, from where if you fell you might be injured? 1. Yes 2. No
	S2Q2B	…use electric or gas powered tools? 1. Yes 2. No
	S2Q2C	…use sharp tools? 1. Yes 2. No
	S2Q2D	…use big or heavy machines or drive vehicles? INTERVIEWER: IF NEEDED, "for example, machines that are bigger than you such as assembly machines, tractors, forklifts, cranes, trucks, motorcycles" 1. Yes 2. No
	S2Q2E	… Work long hours in the hot sun without a break? 1. Yes 2. No
	S2Q2F	… work underground or in tunnels? 1. Yes 2. No
	S2Q2G	…work or travel to or from work when it is dark? 1. Yes 2. No
	S2Q2H	… do the same task over and over at a fast pace for long hours? 1. Yes 2. No
	S2Q2I	… work somewhere with unsafe electric wires or cables? 1. Yes 2. No
	S2Q2J	… work with liquids or powders that irritate your skin, burn easily, give off vapours that smell bad or can explode? 1. Yes 2. No
	S2Q2K	…work in very a noisy place, so that you had to shout to speak? 1. Yes 2. No

Relevance criteria	Question number	Question and response options
	S2Q2L	…work outdoors in very rainy or wet weather? 1. Yes 2. No
	S2Q2M	… work somewhere dust, smoke, or fumes made it hard to breathe or see? 1. Yes 2. No
IF YES (DUST)	S2Q2M1	What was the source of the dust? 1. CUT ROCK 2. SOIL 3. OTHER
IF OTHER	S2Q2M1_OTHER	RECORD OTHER
	S2Q3	Do any kids younger than 12 work at the place you work? 1. Yes 2. No 77. DON'T KNOW 99. REFUSED INTERVIEWER: IF RESPONDENT ISN'T SURE OF AGES OF COWORKERS, SAY: "Your best guess is fine."
		SECTION 3
	S3Q1	Have you ever gotten hurt or sick because of your work in this job? 1. Yes 2. No 99. SKIP
IF HURT/SICK	S3Q1A	Did you need to go to a clinic or health post? 1. Yes 2. No 99. SKIP
IF HURT/SICK	S3Q1B	Did you need to go to a hospital? 1. Yes 2. No 99. SKIP
	S3Q2	Does someone tell you what to do when you're doing mining activities? 1. Yes 2. No 99. SKIP
ASK IF HIRED BY SOMEONE ELSE	S3Q2A	Is this person a member of your family? 1. Yes 2. No 99. SKIP

Relevance criteria	Question number	Question and response options
ASK IF HIRED BY SOMEONE ELSE	S3Q2B	Would this person let you stop this work if you wanted? 1. Yes 2. No 99. SKIP
	S3Q3	Have you ever been punished for mistakes made at work? 1. Yes 2. No 99. SKIP
	S3Q4	Where are the minerals you mine sold? [TEXT]
	S3Q4A	INTERVIEWER: INDICATE THE TYPE OF PLACE DESCRIBED BY THE RESPONDENT 1. MINERAL PROCESSING PLANT 2. INTERMEDIARY/MIDDLE MAN 3. LARGE MINING CORPORATION 55. OTHER
	S3Q5	What do you like to do for fun? 1. SHOPPING 2. PLAYING SPORTS 3. WATCHING TV 4. PLAYING VIDEO GAMES/ COMPUTER GAMES 5. GAMBLING 55. OTHER 66. NOTHING 77. DON'T KNOW 99. REFUSED PROGRAMMER: SELECT MULTIPLE
	SURVEY_END	Thank you very much for sharing your experience.
	NOTES	INTERVIEWER: RECORD NOTES

SUPPLY CHAIN KEY INFORMANT INTERVIEW PROTOCOL

Introduction Questions:

1. Could you please tell me your role and what you focus on?
    a. Is there other experience you have in the copper/cobalt industry?
2. Can you describe your organization's work in the copper/cobalt industry?
    a. PROBE FOR WHAT KIND OF ACTIVITIES IN THIS AREA DO YOU AND YOUR ORGANIZATION UNDERTAKE?

A. Supply Chain Theme General:

3. Could you please tell how the supply chain of copper/cobalt works in Zambia?
    a. What laws and regulations are central to operations in the copper/cobalt industry?
    b. How do informal actors contribute to the production of copper/cobalt in Zambia?
        i. Probe for information on the number of informal actors within the copper/cobalt industry
4. How important is the copper/cobalt industry to Zambia? How about to the Copperbelt province? North-Western province?
    a. How important is the (artisanal / small scale / informal) sector compared to the (larger-scale / formal) sector?
    b. What has/have been the most significant change(s) to the industry in the last few years? Please tell me more about that (TMMT).
5. Have there been any recent socio-political events that have impacted the supply chain? TMMT.
    a. How have they impacted your company?
6. Who are the major stakeholders and influencers in the copper/cobalt industry at each stage of the supply chain (extraction, smelting, domestic, export) processing?

B. Production:

7. Could you please describe the production process of (INTERVIEWER, ADAPT TO RESPONDENT: copper/cobalt / downstream goods containing copper/cobalt) from the beginning to the end? Where does your company become involved in that process?
    a. How are these goods transported from one location to the next? How does your company transport / receive the goods?
8. After extraction, what processing occurs in Zambia?
    a. What about specifically in Copperbelt province? North-western province? Where are the main processing areas (PROBE FOR GEOGRAPHY)?
    b. What goods (including bi-products and downstream goods) are produced in-country? What about in Copperbelt province? North-western province?
    c. Of these, which are the most common (or produced) by your company?
    d. Are these consumed domestically or for export? TMMT.
9. Is there a list of copper/cobalt mines in Zambia? How would we be able to access it?
    a. Probe if the participant is willing to share the information of who to contact to get access.
    b. (IF PROCESSOR ASK) Do you have a list of production sites that are a part of your supply chain? Tell me more about how that list is updated / maintained.
    c. (IF TRADER ASK) Do you have a list of production sites or processing facilities that you sell to? Tell me more about how that list is updated / maintained.
    d. (SPECIFIC PROBE) Is there a list of informal production sites or processing facilities in Zambia? How would we be able to gain information on these entities or access to these sites?

C. Tracing and Due Diligence:

10. What types of products does copper/cobalt from Zambia end up in? (PROBE FOR BOTH INTERMEDIARY GOODS AND FINISHED/END GOODS)? (IF APPLICABLE: Which of those goods does your company make?
11. How might one track copper/cobalt extracted at a particular mine through the domestic supply chain?
    a. Could you walk us through how your company does this?
    b. Is there a point in the supply chain where you anticipate tracking would no longer be possible? (probe for specifics on what stakeholder the traceability ends with, ex: intermediary buyer, exporter, etc.)
        i. (SPECIFIC PROBE) When does the mixing of copper/cobalt from different sites occur, how does mixing occur?
        ii. (SPECIFIC PROBE) How does the presence of illegal or informal smelters, or "backyard smelters" impact traceability within the sector as a whole?
12. What oversight is being conducted by the government when it comes to labor standards within the copper/cobalt industry and its supply chain? How does this impact your company?
    a. PROBE FOR SPECIFICS ON WHAT THE INITIATIVES ARE AND WHO IS PROMOTING THEM (E.G. GOVERNMENT, INTERNATIONAL CORPORATIONS, DOMESTIC COMPANIES))
    b. What about any supply chain traceability initiatives specifically? Please explain the stakeholders involved, including your own company.
    c. What are the different certifications available for companies in the supply chain and how common are they?
        i. How are these certifications monitored / approved and is your company a part of any of them? If so, please explain how you got approved and how you are monitored for compliance.
    d. Does this oversight extend to informal actors within the sector?
13. What due diligence initiatives does your company participate in to monitor labor conditions on the mines you source from?
    a. (IF NOT ANSWERED IN PREVIOUS QUESTION) What supply chain or industry certifications does your company current have? Can you please explain the process involved in obtaining the certification(s) and how you are monitored for compliance?
        i. Are you actively working to obtain any additional certifications in the near future? TMMT.

D. Sourcing Questions for buyers (middlemen, traders, and processors)

14. Where do you source your copper/cobalt from?
    a. PROBE (geographical region, names of sites, etc.) PROBE SPECIFICALLY FOR SAMPLE AREA
    b. Please explain your sourcing process (buying method, transportation process, etc.)
    c. Do you keep the copper/cobalt you buy from each source separate and at what point do you combine copper/cobalt from multiple sources? TMMT.
15. How often do you source copper/cobalt from these places within Copperbelt province? North-western province?
    a. Are there times of the year when this changes? TMMT.
    b. How do you determine how much you buy from a source?
16. (IF NOT COVERED PREVIOUSLY) Who are your primary buyers? PROBE (regions, companies, countries, specific industry)

E. Post Export Questions

17. How would you describe the role of copper/cobalt exports from Zambia in the global trade of copper/cobalt?
    a. What are some international markets?
        i. Are there any recent changes (emerging/declining) in these markets? (PROBE FOR COUNTRIES AND/OR COMPANIES)
18. Who are the major players / stakeholders that import copper/cobalt from Zambia? TMMT.
    a. Who are the major exporters and importers involved in this? Can you describe in what product form the good is exported ?
    b. Are you aware of situations where the importing company is formally connected to exporters in Zambia? (PROBE FOR CONTRACTS, OWNERSHIP, PART OF SAME LARGER COMPANY, ETC.)
    c. Are you away of situations in which copper/cobalt is exported informally from Zambia?
19. Do major importing countries produce copper/cobalt domestically?
    a. How have changes in domestic production impacted/changed imports of copper/cobalt?
    b. At what stage do (copper/cobalt imports become mixed with domestically produced copper/cobalt?
20. Does the downstream use of copper/cobalt imported from Zambia differ from the downstream use of domestically produced copper/cobalt

F. Labor Questions

21. What is your overall impression of working conditions in the copper/cobalt industry in Zambia?
    a. What are the main issues you've heard about? (PROBE FOR CHILD LABOR IF NOT STATED)
22. What can you tell us about labor standards in the copper/cobalt industry, especially when it comes to mining sites?
    a. What are the primary concerns across the industry when it comes to labor standards?
    b. How are labor standards enforced at your workplace and who enforces them?
    c. IF RESPONDENT IS KNOWLEDGEABLE/AMENABLE:
        i. Are children involved in the copper/cobalt sector? TMMT.
        ii. Could you tell me more about the hazards faced by workers?
23. During which stages of the copper/cobalt supply chain are risks for child labor most prevalent?
    a. What are the risk factors at each stage?

G. Conclusion:

24. Could you suggest any organizations or individuals that are well informed about the copper/cobalt supply chain or the labor conditions in the industry that we could interview?
    a. (IF APPLICABLE BASED ON RESPONDENT TYPE: PROBE IF THE INDIVIDUAL HAS ANY ADDITIONAL REPORTS OR DATA THEY ARE ABLE TO SHARE SUCH AS ANY LISTS MENTIONED IN QUESTION 9)
25. Is there anything else you'd like to add?

CHILD WORKER QUALITATIVE RESEARCH INSTRUMENT

1. Can you tell me a little about yourself?
    a. How old you are?
    b. Do you go to school? (NOTE FOR INTERVIEWER: YOU WILL COME BACK TO THIS TOPIC. THIS IS TO GET THE CONVERSATION STARTED)
2. What kind of work / help do you do? INTERVIEWER: ASK RESPONDENT TO FOCUS ON COPPER/COBALT WORK IF HAS MULTIPLE JOBS.
    a. How often do you go?
    b. For how long have you been going?
    c. What kind of minerals do you look for?
3. Do you see any other children working / helping?
    a. If so, how old are they?
    b. What kind of work do they do?
4. Do any of your family members work in mining? Which ones?
5. How did you become involved in your work?
6. What is the main reason you work / help?
7. Think about the last time you worked/helped. I would like to hear about your whole day.
    a. What time did you go there? Whom did you go with?
    b. What did you do when you got there? And then? [INTERVIEWER: CONTINUE TO PROMPT UNTIL RESPONDENT RECOUNTS FULL DAY]
    c. When did you go home? How did you know it was time to go home?
    d. Was that a pretty normal day? IF NO: Why not?
8. How do you feel while you're at work? PROBE FOR EMOTIONAL STATE
9. Are the tasks you do hard? Which ones? What makes them hard?
10. What do you have to be careful about at work? Do you do anything to protect yourself?
    a. Have you ever gotten hurt or sick because of your work? Tell me more about that.
    b. PROBE: Do you breathe in dust? Is it dust from cut rock or from soil?
    c. Have you ever seen anyone else at your worksite get hurt or sick? Tell me what happened. Does this happen a lot?
11. Who tells you what to do when you're there? Anyone else? [INTERVIEWER: ESTABLISH WHETHER PEOPLE REFERENCED ARE FAMILY MEMBERS]
12. Does this person / do these people ever do anything to make you work harder or faster? Tell me more about that.
13. What happens if you make a mistake?
14. Are you paid for your work? How much do you earn?
15. After the **copper** leaves the **site**, do you know where it goes? / Who buys it?
        i. (PROBE AS NEEDED INTO THE SUPPLY CHAIN IF THE RESPONDENT APPEARS TO BE KNOWLEDGEABLE.)
        ii. ASK ABOUT ANY OTHER MINERALS THE CHILD MINES.
16. I'd like to hear more about your life outside of (site type).
    a. IF DOES GO TO SCHOOL: Do you like school? Does your work make it hard to go to school or do schoolwork? Please explain.
    b. IF DOES NOT GO TO SCHOOL: You mentioned you don't go to school. Tell me more about that.

NOTE TO INTERVIEWER: ASK ONE OR BOTH OF THESE QUESTIONS TO END THE INTERVIEW ON A POSITIVE NOTE

17. What do you like to do for fun? Tell me more about that.
18. What kind of job would you like to have in the future?

ADULT WORKER QUALITATIVE RESEARCH INSTRUMENT PROTOCOL

Introduction/ Supply Chain:

1. Could you please tell me about your work?
    a. How long have you been doing it?
    b. How did you get started?
2. Do you have any children and if so, how old are they?
3. (*IF RESPONDENT HAS CHILDREN AGE 5+, IF NOT SKIP*) Do your children work in copper/cobalt production? Why or why not?
    a. If so, what tasks do they perform?
        i. Are they assisting you or performing other tasks?
    b. If so, how often do they accompany you at the worksite?
4. In your work within the good industry how often have you witnessed/observed any children at the worksite?
    a. What tasks have you seen them perform?
    b. Are you aware of if they are accompanied by an adult/parent or are they alone?
5. Are there certain tasks that only children do (instead of adults)? Please explain
6. At what age do people typically start working in copper/cobalt production?
7. In your opinion, at what age should people start working in copper/cobalt production?
    a. (IF PEOPLE BEGIN WORKING EARLIER THAN THE RESPONDENT THINKS THEY SHOULD) Why do you think people begin working sooner? Any other reason?
8. How do people in your community feel about children working in copper/cobalt production?
9. What types of copper/cobalt industry activities do people under 18 typically do?
    a. What activities are more suited to younger children, which to adolescents?
    b. Girls versus boys?
10. Which groups of children are more likely to work in (target good)?
    a. PROBE: Local or migrant children? Girls or Boys? Ages? Etc.
    b. PROBE: Have you heard about street kids from other cities coming to work in copper/cobalt production?
11. Who decides that a child will work?
    a. What happens if that child refuses?
    b. Can a child choose to stop working? Do you feel that children are forced to work – please explain?
12. Are children typically paid for their work?
    a. What do they receive? How does this differ from adult workers?
13. How many hours in a day do children typically work?
    a. Does this change in relation to the time of year / season?
14. Are there any challenges to accessing schooling in your community? If yes, please explain.
    a. Does this relate to children's participation in copper/cobalt activities?
    b. Do children who do copper/cobalt production activities tend to also attend school? If yes how does work affect their schooling? PROBE FOR: availability, concentration, performance
15. Do you consider the work children do in copper/cobalt production to be dangerous?
    a. Why or why not?
    b. Have you seen any children get injured while doing this work? If so, did they receive help? Who helped them?

16. Are children performing activities on the worksite treated the same as adults? If not, what is the difference?
17. In your perspective, how do children feel about their participation in the industry? Please explain
18. What changes would need to happen in your community to prevent people under 18 from working in copper/cobalt production activities?
19. Do you know where copper/cobalt goes after it leaves your workplace?
    a. PROBE FOR:
        i. How is it sold?
        ii. How is it transported before / after sale?
        iii. Who buys it?
20. What do you know about jerabos and the mining sector?
21. Is there anything else you'd like to add?

(INTERVIEWER: THANK THE RESPONDENT FOR THEIR PARTICIPATION AND END THE INTERVIEW)

LABOR RIGHTS/LABOR CONDITIONS KEY INFORMANT INTERVIEW PROTOCOL

A. Introduction Questions:

1. Could you please tell me your role and what you focus on?
    a. Do you have any other experience in the copper and cobalt industry?
    b. Can you describe your organization's work? IF NEEDED, How does it relate to people under age 18 working in copper and cobalt industry?
        i. What age groups do you work with?
        ii. Do you do any additional work with families of working children or other stakeholders such as industry groups, government bodies, or CSOs?

B. Child Labor Questions General:

2. Have you heard of people under age 18 working or helping their parents in Copperbelt and North-Western provinces in the **copper and cobalt** industry?
    a. Has this changed in recent years? Tell me more about that please (TMMT).
    b. PROBE FOR SPECIFICS ON: CHILDREN 15-17, CHILDREN 13-14, AND CHILDREN 12 AND YOUNGER
    c. Have you, personally, observed people under age 18 working? PROBE for hazards, ages, hours
3. Now I would like to ask you some questions about child labor in copper/cobalt mining. By "child labor," I mean the involvement of children and young persons under age 18 in copper and cobalt mining activities. How prevalent is child labor in copper and cobalt production?
    a. PROBE FOR SPECIFICS ON: CHILDREN 15-17, CHILDREN 13-14, AND CHILDREN 12 AND YOUNGER
    b. Where is child labor most prevalent? – PROBE FOR SPECIFICS (REGION, SITE/EMPLOYER TYPE, ETC.) PROBE SPECIFICALLY FOR COPPERBELT AND FOR NORTH-WESTERN PROVINCE.
    c. What types of children and young persons are most at risk for child labor (race, sex, ethnicity, migratory status, etc.)?
4. In your opinion, what are the main causes of child labor in the copper and cobalt industry?
    a. (PROBE FOR INDUSTRY SPECIFIC ANSWERS) Why might an employer choose to hire children or young persons under age 18? Are there different reasons depending on the age of the child or young person?
5. Are people under age 18 involved in the processing of copper and cobalt at all? TMMT.
    a. IF YES: Do people under age 18 work in smelting overnight?
6. Is child labor present at all types of mines? PROBE artisanal, smallholder, or informal sites

C. Recruitment and Working Hours:

7. Could you tell me how people under age 18 become involved in the copper and cobalt industry?
    a. Are the jobs arranged? If so, by whom? (PROBE FOR FAMILY INVOLVEMENT)
        i. Is a recruiter involved? - IF SO, REQUEST DETAILS AND PROBE ABOUT FEES
    b. Have you heard of people under age 18 being sold or taken by force to work in the copper and cobalt industry? PROBE: There were some news stories about street kids working for jerabos. Have you heard anything about that? TMMT.
8. When are people under age 18 typically engaged in labor activities in copper/cobalt?
    a. PROBE ALL FREQUENCIES**:** HOURS PER DAY/WEEK, NUMBER OF DAYS PER WEEK, TIME OF DAY? SEASONAL OR YEAR-ROUND?

b. PROBE FOR SPECIFICS ON: CHILDREN 15-17, CHILDREN 13-14, AND CHILDREN 12 AND YOUNGER

9. Are children and young persons who work or help in the copper and cobalt industry able to attend school regularly? TMMT.
   a. If able, how often? / If unable, why? (PROBE FOR SPECIFICS ON: CHILDREN 15-17, CHILDREN 13-14, AND CHILDREN 12 AND YOUNGER)
   b. In your opinion / expertise at what age do children or young person's stop attending school to work in the copper and cobalt industry?
10. Are people under age 18 paid for their work? If so, are they paid directly or is someone else paid for their work? TMMT.
    a. If so, in what form? (Hourly or piece-rate, cash, or another means)
    b. Are they generally paid on time?
    c. Are they paid fairly? PROBE FOR WAGE THEFT
    d. Have you heard of children or young person's having their wages deducted? TMMT. PROBE FOR FEES FOR SITE ACCESS OR EQUIPMENT

D. Working Conditions:

11. Are there any tasks that families or employers consider more suitable for people under age 18 to perform? Why?
    a. PROBE FOR SPECIFICS ON: CHILDREN 15-17, CHILDREN 13-14, AND CHILDREN 12 AND YOUNGER
    b. Are there certain tasks of these that you mentioned that are more hazardous or dangerous than others? TMMT.
12. What kinds of dangers/risks are people under age 18 in the copper and cobalt industry exposed to? (Exposure to chemicals, sharp hand tools, etc.)
    a. PROBE FOR SPECIFICS ON: CHILDREN 15-17, CHILDREN 13-14, AND CHILDREN 12 AND YOUNGER
    b. Are people under age 18 provided with protective gear? What kind?
    c. Have you heard of people under age 18 being injured while working? TMMT. Who pays for medical costs?
    d. At what types of sites are these dangers present?
13. How are people under age 18 treated by their employers / family members when working?
    a. Have you heard of them feeling threatened at work? TMMT.
    b. Have you heard of children and young persons working in the copper and cobalt industry/sector being mistreated in any way? – TMMT.
    c. Have you heard of situations where people under age 18 cannot leave their job if they chose to? TMMT.
    d. In your experience or opinion, how do children feel about their work?

E. Community Attitudes & Efforts:

14. What is the local attitude towards the use of child labor in the copper and cobalt industry?
    a. PROBE FOR SPECIFICS ON: CHILDREN 15-17, CHILDREN 13-14, AND CHILDREN 12 AND YOUNGER
15. Do you know of any efforts by government or non-government entities to prevent child labor or remove children or young persons from working in the copper and cobalt industry? Please tell me more about the one you are most familiar with.
    a. Where are these efforts occurring (nationally, regionally, etc.)?

16. What about worker associations or employers / site owners or wider industry initiatives? What do they do to prevent child labor or remove children or young persons from working in the copper and cobalt industry?
    a. Where are these efforts occurring (nationally, regionally, etc.)?
    b. (PROBE FOR SPECIFICS ON MONITORING POLICES)
17. What are the relevant laws used to safeguard against child labor in the (target good) industry?
    a. How are these laws enforced? PROBE: What about inspections? Penalties for violations?
    b. In your opinion, how effective are these laws at preventing/addressing child labor?

F. Supply Chain Specific Questions:

18. Who buys the minerals produced with child labor? Where do they go next?
19. Does copper/cobalt from mine sites where people under age 18 work get purchased by large-scale producers?
    i. If yes, can you tell me which large scale producers purchase from artisanal sites?
    ii. Why do large scale producers purchase from artisanal sites? Why do you think owners of artisanal sites decide to become part of the supply chain of large-scale producers?
20. Who are the main stakeholders (e.g. companies) in the copper and cobalt industry of Zambia involved in the sale and processing of copper and cobalt from sites that use child labor?
21. At what point is copper and cobalt produced at sites at risk for using child labor mixed with copper and cobalt that is produced without child labor?
22. How is copper and cobalt obtained with child labor used in Zambia?
    a. Do you know of any specific products?

Conclusion:

23. What changes would need to happen to prevent people under the age of 18 from working in copper and cobalt mining?
24. Could you suggest any organizations or individuals that are well informed about the copper and cobalt industry/sector supply chain or child labor in the industry that we could interview?
    a. (IF APPLICABLE BASED ON RESPONDENT TYPE: PROBE IF THE INDIVIDUAL HAS ANY ADDITIONAL REPORTS OR DATA THEY ARE ABLE TO SHARE)
25. Is there anything else you'd like to add?