



Mapping of the Artisanal Copper-Cobalt Mining Sector in the Provinces of Haut-Katanga and Lualaba in the Democratic Republic of the Congo

Editorial

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Bundesanstalt für Geowissenschaften und Rohstoffe

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Executive Summary

The Democratic Republic of the Congo (DRC) is the world's largest cobalt producer. Cobalt is a key commodity for battery-powered vehicles and other modern technological developments. Cobalt ore, along with copper, is hosted by the so-called Copperbelt in the south-eastern DRC where the ore is mainly extracted through large-scale industrial mining. However, a significant fraction of cobalt is also produced through artisanal and small-scale mining (ASM) activities by a fluctuating number of more than 100,000 miners. The ASM sector has a strong impact on poverty reduction and local income growth, especially as far as low-skilled jobs are concerned.

Aside from its economic significance, the artisanal copper-cobalt sector faces a number of sustainability challenges that have been prominently discussed in the media since 2016. These challenges include due diligence risks, in particular with regard to child labour and the lack of transparency within local supply chains. Other aspects such as unfair payment of small-scale miners or inadequate occupational health and safety standards represent equally relevant challenges. These challenges manifest themselves on the backdrop of general deficiencies in terms of ASM sector formalization, with the sector commonly operating in legal grey areas or in an entirely illegal space.

Together with its Congolese partners, the Federal Institute for Geosciences and Natural Resources (BGR) supports tools and mechanisms to improve control and transparency in the Congolese mining sector, and especially in the ASM sector, all within the larger bilateral German-Congolese development cooperation framework. These mechanisms include, among others, more effective inspections, monitoring and control procedures of mines and along the associated mineral supply chains. In this context, the CTC (Certified Trading Chains) scheme represents a key instrument to support both long-term strengthening of capacities of ASM cooperatives and independent third party performance evaluation of artisanal mining operations. The scheme has been selectively applied in the artisanal mining of tin, tantalum, tungsten and gold (3TG) in the eastern DRC.

In concert with local partners, the BGR encourages adapting the lessons learnt from the 3TG sector in the copper-cobalt sector as well. To this end, the applicability of instruments developed for the 3TG sector needs to be verified and refined based on copper-cobalt sector-specific baseline data. Therefore, the BGR organized an inventory and analysis of the national artisanal copper-cobalt sector by means of an ASM mine survey carried out in the DRC's key cobalt-producing provinces of Lualaba and Haut-Katanga in April and May 2019. The survey was conducted by multi-stakeholder field teams comprising the BGR, the Carter Center and the Congolese artisanal mining authority, SAEMAPE. Field teams were deployed to register data from a total of 102 artisanal mines producing copper and cobalt, 58 of which eventually provided detailed administrative and socio-economic data.

The evaluation of thus generated data indicates that there are several cooperatives operating on artisanal copper-cobalt mine sites that show a potential for long-term professionalization and strengthening of their capacities. At the same time, other ASM sites presently do not allow for a meaningful engagement in this manner, for various reasons. The widespread informality and illegality in the ASM copper-cobalt sector represent significant obstacles for establishing effective national or international support interventions at a local scale. This implies risks that support interventions selectively focus on few mines, without stimulating significant improvements across the ASM sector as a whole.

The survey found highly heterogeneous conditions characterizing the local ASM sector. Child labour was detected in some ASM mines although it is not considered an omnipresent problem, especially as far as the worst forms of child labour according to the applicable definition by the International Labour Organization is concerned. The latter definition forms the base for the associated risk mentioned in the OECD supply chain due diligence guidance. The currently observed scale of child labour differs significantly from that of earlier publications. The military and the police were present in several of the visited copper-cobalt mines implying weakly enforced governance structures and risks for human rights violations – these are considered as important challenges with regards to supply chain due diligence risk management.

This study confirms a number of sustainability challenges that characterize the ASM copper-cobalt sector beyond due diligence risks. These include occupational health and safety problems as well as unfair payment conditions and conflicts, often related to the location of artisanal mine sites next to large-scale mines or close to local communities. Occupational health and safety risks are apparent in poor mine design, lack of personal protective equipment, lack of training and accident records as collected during the course of this mapping exercise. Artisanal miners face several challenges with regard to their mining-related livelihoods and income structures: local mineral buyers dictate prices for copper-cobalt ore where pricing practices often follow incomprehensible, opaque and unfair pricing procedures. The resulting economic disadvantages are further exacerbated by requests for illegal taxes and fees by some government authorities. Mining activities within residential areas of the cities of Kolwezi and Likasi result in grievances such as the presence of children (without necessarily implying worst forms of child labour, though), lack of occupational health and safety for workers and health risks for their family or local community members.

Based on these observations, the study develops a number of recommendations to remedy some of the identified challenges. These refer to both measures supporting the formalisation of the ASM sector as well as improving risk mitigation and risk management in local copper-cobalt supply chains. Involving all relevant local parties – government services, ASM cooperatives and civil society – through a multi-stakeholder approach is key for ensuring broad acceptance, credibility and sustainability of such support measures.

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List of Abbreviations

3T	Tin, Tantalum, Tungsten
ANR	Agence Nationale de Renseignement
ASM	Artisanal and Small Scale Mining
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe – Federal Institute for Geosciences and Natural Resources
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung - Federal Ministry of Economic Cooperation and Development
CCCMC	China Chamber of Commerce for Metals, Minerals and Chemicals
CDF	Congolese Franc (1 USD = 1605 CDF OANDA Exchange rate 15.05.2019)
CTC	Certified Trading Chains
DiviMines	Division des Mines
DEMIAP	Détection Militaire des Activités Anti-Patrie
DGM	Direction Générale de Migration
DSF	Département de Sécurité des Frontières
DRHK	Direction des Recettes du Haut-Katanga
DRLU	Direction des Recettes du Lualaba
ETD	Entité territoriale décentralisée
GIZ	Gesellschaft für Internationale Zusammenarbeit
GIZ InS	Gesellschaft für Internationale Zusammenarbeit – International Services
LME	London Metal Exchange
LSM	Large Scale Mining
MoU	Memorandum of Understanding
NGO	Nongovernmental Organisation
FARDC	Forces Armées de la RDC
OECD	Organisation for economic co-operation and development
OHADA	Organisation pour l'Harmonisation en Afrique du Droit des Affaires
OM	Open Market
PMH	Police des Mines et des Hydrocarbures
PNC	Police Nationale Congolaise
PE	Permis d'Exploitation
PEPM	Permis d'Exploitation de la Petite Mine
PER	Permis d'Exploitation des Rejets Minier
PR	Permis de Recherche
RCI	Responsible Cobalt Initiative
RMI	Responsible Minerals Initiative
RMCA	Royal Museum for Central Africa
SAEMAPE	Service d'Assistance et d'Encadrement du Secteur Artisanale et à petite Echelle
SMIG	Salaire Minimum Interprofessionnel Garanti – Minimum Wage
TCC	The Carter Center
ZEA	Zone d'Exploitation Artisanale

1. Background

The Federal Institute for Geosciences and Natural Resources (BGR), in cooperation with the Congolese Ministry of Mines, its subordinate technical services as well as with enterprises or cooperatives in artisanal and small-scale mining (ASM), supports the implementation of the CTC ("Certified Trading Chains") certification system in the eastern Democratic Republic of the Congo (DR Congo). Since 2009, the project has been implemented as part of a joint BGR-GIZ programme within the German-Congolese technical development cooperation portfolio, on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

The CTC approach is based on a combined system of support measures and independent control mechanisms and is thus regarded as a key instrument for improving the economic, environmental and working conditions as well as the legal status of Congolese ASM stakeholders. It specifically strengthens the sustainability performance of companies and cooperatives, beyond the minimum requirements of due diligence and conflict-free supply chains. While the CTC approach has focused on the sector of the so-called "conflict minerals" (tin, tantalum, tungsten and gold, 3TG) to date, it has the potential to be applied on other raw materials in the ASM context.

The strengthening of transparent and sustainable supply chains, the establishment of responsible mining practices and the support of formalisation efforts by state, civil society and private actors in the ASM sector are essential accompanying measures in the implementation of CTC. This includes, among other things, the development of methods to improve the management of due diligence risks in ASM supply chains. The collection and evaluation of technical monitoring data, as already done in the 3TG sector at a broad scale, forms an important prerequisite to this step.

In contrast to the 3TG sector, the artisanal copper-cobalt sector in the DR Congo is currently poorly regulated. However, as described in more detail in the following chapter, the sector has increasingly moved into the focus of international public attention in recent years. For this reason, the project partners BGR and the Ministry of Mines decided to carry out a mapping and assessment of the situation on the ground in order to collect relevant baseline data on ASM sites. Implementation of these mapping efforts benefited from the support of and was authorized by the responsible national and provincial authorities. Field work itself was performed in direct cooperation with the Congolese ASM authority, SAEMAPE.

On this background, this report presents the results of an assessment of the conditions in artisanal copper-cobalt mining in the provinces of Haut-Katanga and Lualaba.

2. Introduction

Copper-cobalt mining in DR Congo

In the DR Congo, cobalt has been mined since 1924 as a by-product of copper production from primary and secondary enriched deposits and has also been recovered from historical tailings for more than 20 years. In the course of Congolese mining history, copper mining was carried out on an industrial scale by (semi-)state-owned and private companies. The decline of the Congolese industrial mining sector after many years of mismanagement and the wars and crises of the 1990s led to the expansion of artisanal copper and cobalt mining. This was also due to the relatively easy access to mineralized zones, as they are usually close to the surface and little mechanized equipment is needed for extraction. With the gradual recovery of the sector and new private-sector dominance, especially in the last ten years, cobalt in the DR Congo now is mainly mined as a by-product of industrial copper mining (Fig. 1). However, a variable share of copper and cobalt mining continues to take place in the less regulated ASM sector (Al Barazi et al. 2017). With a share of 48% of global cobalt reserves and a 60% share of global cobalt production in 2017, the DR Congo has a dominant position in the world market for the supply of this raw material. It has to be taken into account that a large part of the Congo is still considered insufficiently prospected and underexplored (Al Barazi 2018).

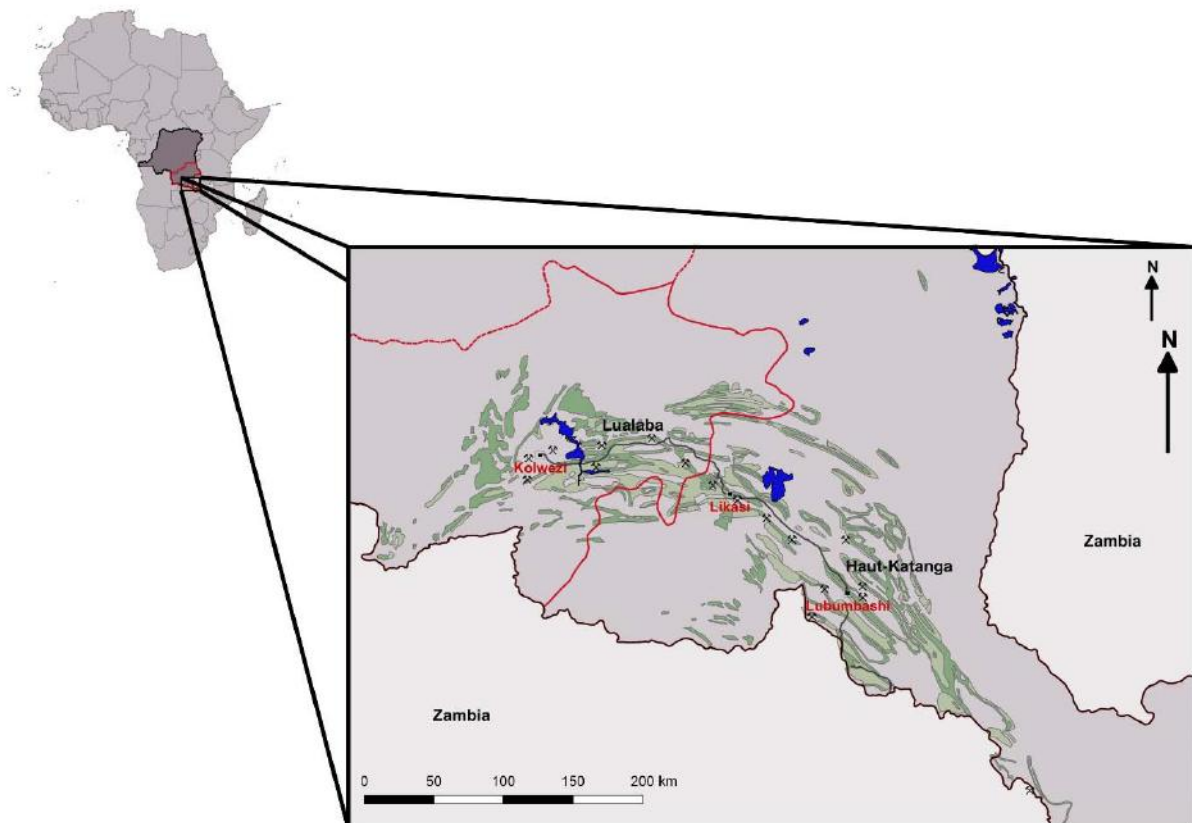


Figure 1 Congolese part of the Central African Copper Belt. Shown are the three major cities of the region as well as the largest copper and/or cobalt producing industrial mines (currently and in the near future). The most important ore rich geological formations of the copper belt are shown in green.

Due to rising cobalt prices from the end of 2015 to mid-2018, triggered by projected supply deficits in the automotive sector (e-vehicles), as well as by rising demand, mine production in the copper belt of the DR Congo increased significantly in the short term. Exploration projects were intensified, cobalt production was maximised and the Congolese government classified

cobalt as a strategic raw material and increased royalties from 3.5% to 10%, therefore almost tripling the previous levy (Journal Officiel 2018a). A nationalist rhetoric of various Congolese stakeholder groups established itself, calling for the DR Congo to make greater use of its dominant, almost monopolistic position in cobalt supply.

At the same time, an increase in artisanal production was evident. Large migratory movements of Congolese towards the Lualaba and Haut Katanga Provinces, looking for better livelihoods, attracted by high cobalt prices and the resulting income opportunities, were observed. Estimates of the number of active miners in 2017/2018 were approximately 150,000 to 200,000, many of whom migrated from the neighbouring Kasai provinces. Much of the artisanal cobalt production, as described in this report, takes place illegally or at least informally. The individual local supply chains of artisanal cobalt ore to the processing refineries are hardly comprehensible to outsiders.

However, the deficit in cobalt supply that was anticipated globally was compensated within a short period. Analysts estimate that this was largely due to the artisanal mining sector that could respond quickly to the global demand and increase production. Ultimately, this led to an oversupply by Chinese refineries in cobalt sulphate, a raw material required for the cathode production of batteries (Roskill 2019, CRU 2019). The capacities of the Chinese refineries were rapidly expanded, supported by significant investments.

Oversupply, coupled with intensified battery cell research towards lower-cobalt containing cathodes (Al Barazi 2018), led to a correction of the projected short to mid term supply deficit. After a one and a half year high from late 2016 to mid 2018, price of cobalt declined to 2016 levels of \$30000/t by early 2019 (Fig. 2). This can also be seen in the Congolese ASM sector. Mining cooperatives that can afford it put cobalt-rich ore on stockpile and sell only copper-rich ore, as the copper price currently remains more attractive in comparison (profit margins)¹. The numbers of miners and depots seem to have declined².

¹Many artisanal miners have enough experience to know which geological formations are more Co or Cu rich. Sometimes only colour (green/black) is the criteria for distinction and production targets Cu more precisely. Furthermore, following first processing steps, the metal content is indicated by spectrometer analysis, after which the miners decide whether they want to sell or stock.

² Depots are warehouses which are either located on the mine site or agglomerated on the national road between Lubumbashi and Kolwezi on so-called open markets. Depots purchase copper-cobalt ores from artisanal extraction.

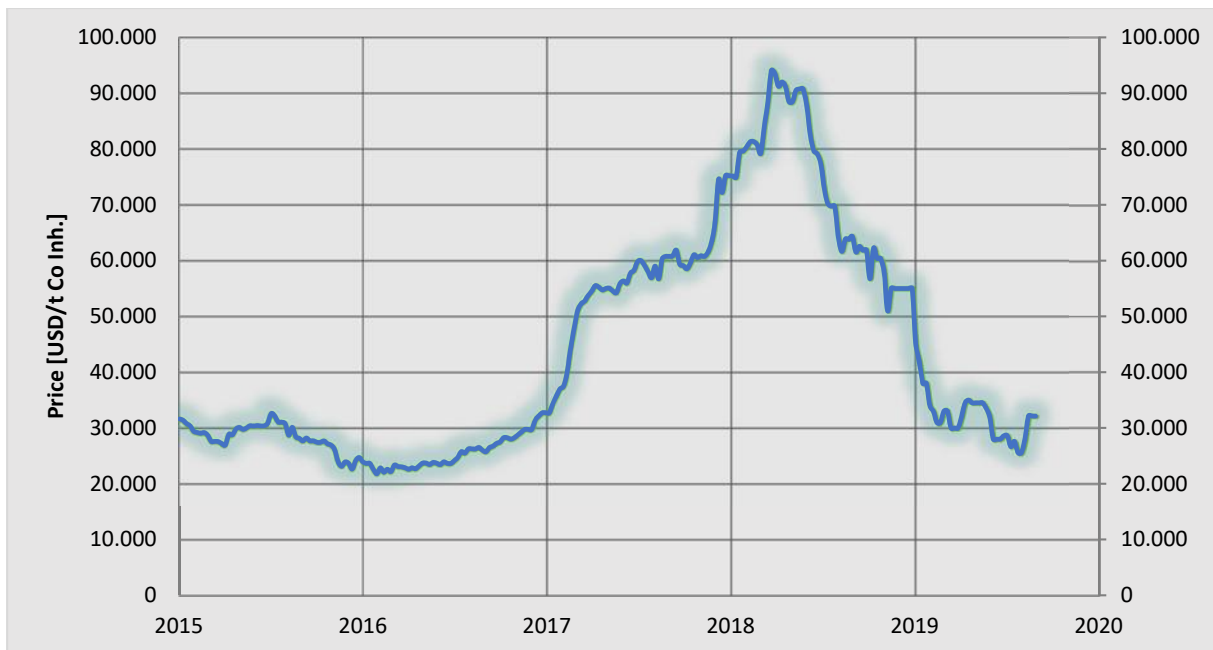


Figure 2 Price development of cobalt since 2015 in US dollars. The diagram illustrates the effects of the described "boom and bust" cycle of the years 2017 to 2019 on price development. The chart shows the LME cash price. (Source: S&P Global Market Intelligence).

Nevertheless, experts see the need in the medium term to increase cobalt production in order to provide the automotive industry with the necessary raw materials for the structural change triggered by the climate debate and the diesel scandal. It remains to be seen whether this will result in a new boom in the DR Congo, including ASM, and whether the successful development of projects in other countries, primarily Australia, Indonesia and Canada, can significantly change the geographically limited supply possibilities for the raw material cobalt, while taking economic feasibility into account. Cobalt is not extracted directly but as a by-product of global copper or nickel mining and therefore depends on these raw material markets. Against this background, production in the DR Congo remains attractive as it has globally the highest copper and cobalt grades and cobalt-copper ore ratios. Congolese cobalt producers thus benefit more strongly from a positive cobalt price trend, but are also more strongly affected by price declines.

Copper cobalt mining in the DR Congo continues to be a focus of international attention, on the one hand with regard to the supply of cobalt to the industry (for example e-mobility), on the other hand with regard to the risks of due diligence in the cobalt supply chain (traceability, child labour). According to BGR estimates, artisanal production accounts for about 15% of total Congolese exports of cobalt. Due to the lack of sustainable alternatives and temporarily high cobalt prices, the sector exerts still a very strong economic attraction on the impoverished population. At the same time, there are massive concerns about the inadequately implemented state supervision of the sector, resulting in uncontrolled migration movements, shortcomings in occupational health and safety, severe environmental impact, social problems and the evidence of widespread corruption. However, unlike Eastern Congo, the Copperbelt is not a conflict zone plagued by armed groups.

Although cobalt is not defined as a "conflict mineral" in the regulatory sense, it is nevertheless subject to similar risks, some of which are attributable to the general conditions of artisanal small-scale mining in the DRC (Al Barazi et al. 2017). The international press and civil society have repeatedly drawn attention to grievances such as child labour, corruption or harmful

working conditions and also raised critical questions with regards to the responsibility of end consumers (Amnesty International 2016, SOMO 2016, Bloomberg 2018, 2019a & 2019b, Financial Times 2019, Zeit 2019).

Artisanal mining on industrial concessions without permission is inevitably considered an illegal activity (theft of the property of industrial concessionaires). The intrusion of artisanal miners performing “hand picking” on industrial concessions is difficult to prevent and control, and may imply reputational damage depending on the licence holder’s chosen risk mitigation approach (Reuters 2019, Amnesty International 2019). There is not only the risk of contamination of the supply chain with illegal ASM material. Accidents suffered by artisanal miners within their concession, even if the miners are illegally active, also have an impact on the reputation of industrial operators. Due to unsafe working conditions, the risk of accidents in illegally operated artisanal and small-scale mining are very high.

Despite the risks mentioned above, it should also be stressed that in the context of the poorly diversified economy and omnipresent poverty in the DR Congo, artisanal and small-scale mining will continue, in the short and at least medium term, as it offers sources of income for large parts of the Congolese population. The lack of income generating alternatives and the resulting persistence of the artisanal mining sector inevitably call for regulations and the introduction of sustainable and responsible practices. This is all the more important in a sector that can provide more jobs than the industrial mining sector. This applies both to copper cobalt mining and to other Congolese commodities such as gold, tin, tantalum and diamonds.

As a result, some companies and industry associations downstream the cobalt supply chain stress the need to establish and maintain due diligence. For example, the China Chamber of Commerce for Metals, Minerals and Chemicals (CCCMC), in collaboration with a number of international companies, has launched the Responsible Cobalt Initiative (RCI), which aims to work with the Responsible Minerals Initiative (RMI) to promote the implementation of OECD Guidelines in order to promote responsible supply chains.

Further initiatives and projects promote transparency efforts (CIRAF by the Cobalt Institute, Cobalt Reporting Template developed by RMI) or aim at the validation of cobalt-processing refineries (refiner assurance process, RMI, RCI & CCCMC) by developing frameworks for more transparent reporting or disclosure of the company’s supply chains.

In the course of the disclosure of the grievances both the central government and the regional governments of the two producing provinces Haut-Katanga and Lualaba are intensifying formalisation efforts in the ASM sector, as well as the implementation of inter-ministerial or inter-sectoral strategies to reduce child labour and to create alternative livelihoods for the population of southern Katanga.

In addition, individual pilot projects such as the LSM-ASM cooperation on the Chemaf concession Mutoshi (Reuters 2018a; Trafigura) or the project financed by BMW, Samsung SDI, BASF and to be implemented by GIZInS (Reuters 2018b, GIZ 2018) show that solutions are also being sought at a local, but limited, level. This follows similar pilot approaches to those used in the Congolese tantalum and tin sector in the years 2011-2014, before institutionalised due diligence programmes were implemented on a broader scale. Similar to these sectors, the first step in programming broad-based approaches is to collect baseline data in order to better assess risks.

Data acquisition

Geographical and socio-economic data collection in the mining sector is an essential element in establishing responsible management of the extractive industries in the Democratic Republic of Congo, as several initiatives by technical and financial partners of civil society and government actors in the Democratic Republic of Congo show.

The challenges of the copper-cobalt sector in the Democratic Republic of the Congo therefore require an understanding of the local dynamics that should enable technical and funding partners to support the efforts of the government, mining companies and civil society to formalise the supply chain and to use the mining sector as a development lever.

Below, the methodology of data collection, its results and evaluation are described. Finally, recommendations are made in order to address the sector's immanent problems revealed by this data collection.

"Examples for data collection in ASM in the DR Congo"

Since 2009, BGR is implementing the CTC ("Certified Trading Chains") certification system in the Eastern Democratic Republic of Congo together with partners from the Ministry of Mines. This system is an essential instrument for improving the economic, environmental and working conditions as well as the legal status of local small and medium-sized enterprises and cooperatives. In particular, it strengthens the sustainability of supporting companies and mining cooperatives beyond the minimum standards of conflict absence and due diligence. Audits are carried out to check and evaluate the above-mentioned facts; preparatory and accompanying data collection is indispensable here.

BGR also supported and accompanied the Congolese Ministry of Mines in the implementation of validation missions in the 3TG sector in eastern DR Congo. The purpose of these missions is to examine the conditions of the artisanal mines in the context of the Regional Certification Mechanism of the ICGLR (International Conference on the Great Lakes Region). Conflict-related and legal aspects as well as risks in the sense of due diligence are the focus of these validation missions, the existence of which was a prerequisite for qualification as a mine with production and export approval.

The Belgian NGO IPIS (International Peace Information Services) carried out several data collection missions in Eastern DRC to identify sector-specific grievances such as the influence and presence of governmental and non-governmental armed groups, the risk of human rights violations in ASM, cohabitation issues between artisanal and industrial mining or the illegal taxation of artisanal miners on access roads. The results of these missions, together with the data from the validation missions described above, are made publicly available on a web map.

In 2010, as part of the Democratic Republic of Congo's good governance project for the mining sector - through TF MIRECA II (Task Force Mineral Resources in Central Africa) and the NGO The Carter Center - the Belgian government supported mapping of mining in southern Katanga to address the need to promote transparency, accessibility and understanding of information on the mining sector. This mapping has revealed both similarities and differences between the situation in the East and that in Katanga. In fact, the problem in the mining sector of South Katanga is much less related to the association of mining with conflicts than to the problem of socio-economic and financial benefit, which is too small for the local and Congolese population as a whole, despite the enormous amounts produced. One thing the two regions have in common is a lack of respect for the fundamental human rights of workers and miners.

3. Methodological approach of the mine survey

Preparation & Implementation

In the course of the mapping carried out in the provinces of Haut-Katanga and Lualaba, artisanal mines were surveyed throughout the region and representative data on their modus operandi and surrounding environment were collected and recorded. In addition to economic indicators, legal, administrative and social aspects were also surveyed in order to determine the actual conditions on artisanal mine sites. These data were finally compiled in a database and graphically displayed in a geo-information system.

After the necessary permission had been granted by the National Ministry of Mines of the DR Congo and all the authorities involved had been informed, in April 2019 two field teams consisting of BGR employees, civil society representatives (The Carter Center, TCC) and officials of the Congolese Artisanal and Small Mining Authority SAEMAPE were able to start the mapping in the province of Haut-Katanga. The objectives and methodology of the mapping project were clarified in advance by BGR and TCC in a one-day training course. A total of 10 days were needed for the mapping in the Haut-Katanga province.

After a three-week break, during which the collected data were analysed and the methodology and questionnaire content were optimised, the mapping continued with two field teams in the province of Lualaba, which has larger copper-cobalt mining activity. BGR and TCC used the same team members as for fieldworks in Haut-Katanga. This fieldwork was equally preceded by a training session for SAEMAPE officials. The fieldwork in this province comprised of 19 days.

The focus of the mapping lay on the beginning of the supply chain, i.e. from the mining of copper and cobalt ore to the first domestic sale of production. The main subject of the investigations was thus as far as possible the recording of artisanal mines in designated provinces and the analysis of common mining and trading practices in the sector. In the process:

- Mining cooperatives or their local representatives
- Artisanal miners
- Intermediaries

were observed and interviewed.

A questionnaire was first designed for orientation of the mapping teams and for comparability of the data to be recorded between individual mines. This questionnaire was made available to the field teams both as hardcopy and in the KoboCollect® App. The aim of this duplication was to detect any contradictions within a field team and also to ensure greater data security. In the case of discovered inconsistencies between both versions, project coordination requested clarification from the teams.

The questionnaires aimed at (i) registration of the geographical framework data of the artisanal mines and, (ii) establishing the economic-geological, legal and socio-economic context and were answered by the field teams and their interview partners for each mine. These interviews and observations were also used to assess occupational health and safety risks. Identifying

risks in the context of the OECD Guidelines on due diligence for the promotion of responsible supply chains was a further focus of the mapping. Both quantitative and qualitative data were collected. The questionnaires were filled out on site in duplicate and, if cell phone reception was good, uploaded directly onto the server.

In addition, a guide of behaviour and procedures during mine site visits was developed. The aim was to regulate communication and data collection and to ensure the safety of the field teams in the best possible way through certain rules of conduct. The guide also established control systems to verify the work carried out by the field teams. These include the registration of phone numbers of interview partners, tracking of the movements of the field teams using GPS and start-stop time measurement when filling out the questionnaires in KoboCollect®. The registered phone numbers were randomly called in order to verify the visit and procedure of the field teams. For the purpose of coordination, regular phone calls were made between BGR project management and field teams.

Questionnaire content, data collection methodology and code of conduct were communicated to the field teams during a training session. The training was limited to one day each due to the existing experience of the team members³ in Congolese mining, including ASM context. Once the mapping of accessible mines had been completed, the data between the field teams and provinces were harmonised where appropriate and possible. BGR then compared the results collected concerning legal data with the Cadastre Minier (CaMi⁴) license register and the mining cooperative register (CTCPM 2018; SAEMAPE⁵).

Data quality

On-site inspection of documents was rarely possible, either they did not exist or access to them was denied. A lack of willingness to cooperate, mistrust or aggression also meant that not all questions could be answered or the mine could not be entered at all (sometimes even entire regions). This is reflected in the high number of mine sites where detailed data acquisition was not possible (58 of 102 mines accessible). It was mainly the involvement of state actors (SAEMAPE officials) that made the mission possible and guaranteed the protection of the field teams.

Restrictions identified in the course of the project relate to the quality and reliability of some data. The coverage of the sector by this project and therefore representativeness of collected data cannot be assessed with certainty, as the mapping does not guarantee the inclusion of the sector's entirety. It can be assumed that other mines exist. Due to the varying sources of the data obtained, some aspects have to be assessed differently in terms of their reliability and consistency for instance, statements during interviews were influenced by personal motivations, furthermore ignorance or incomprehension play a role. Identified motivations are the protection of interests (because of illegal activity), cover-up and fear (reprisals on the part of buyers or soldiers/policemen). For example, the existence of a MoU between the cooperative and the license holder was often confirmed on the ground but no documentation could actually prove it. On the other hand, photographs, GPS data and observations by BGR and TCC employees are rated as reliable (e.g. production, legal framework, safety equipment). The field teams consider mine site visits orchestrated or restricted by cooperative

³BGR accompanied validation missions for 3TG producing mine sites in eastern DR Congo, TCC mapping experience in Katanga 2007 and 2010 as well as local SAEMAPE officials with good local knowledge and expertise.

⁴Shapefiles (geoinformatic data) provided by the National Mining Cadastre, updated last: April 2019.

⁵The registers were consulted at the respective SAEMAPE provincial headquarters.

representatives or security officers to be not systematic, but nevertheless selectively restrictive. Finally, it must also be taken into consideration that the data produced represent snapshots of the respective mines and that there is a probability that the conditions in some mines may have changed between the time of the mapping and the time of reporting.

Nevertheless, it can be assumed that the results presented below reflect a statistically relevant proportion of artisanal copper and cobalt mining in the DRC as well as the conditions prevailing in the sector at the time the mapping took place. At the same time, however, this represents by no way a complete coverage of the sector, including the 44 mines not considerable in the presentation of results (see next chapter). It can also be assumed that further distal, poorly developed, mines exist in the territories of Sakania and Kasenga in the province of Haut-Katanga.

4. Mapping scope and framework data

A total of 102 copper and/or cobalt-producing mines have been detected in the course of mapping. Three other detected mines are producing tin ore (cassiterite) and are therefore not considered further in the report (total number of mines: 105). For 23 out of these 102 copper-cobalt producing mines, only their names, produced ore and approximate geographic position (excluding GPS data) are known. For 13 other mines, access and/or data collection was blocked or denied by various parties (Fig.3). Eight other mines were inactive at the time of visit by the field teams, the most common reasons being flooding, excavation work in progress and the transformation of concession type (Fig. 4). The results described in the chapter thus refer to a total of 58 active and accessible mines (Table 1). Merely concerning legality aspects, the inactive and inaccessible mines were also taken into account (79 mines).

Table 1 Overview of the mines surveyed in Southern Katanga and information on consideration of these mines during the data analysis process.

Degree of information	Number of mines	Consideration	
Details unknown	23	None	
3T mine sites	3	None	
Access denied or surveying prohibited	13	Partially	
Inactive	8	Partially	
Active Copper-Cobalt ASM-Sites	58	Completely	
Total of existing Copper-Cobalt ASM sites	102	55 % of mine sites completely considered	75 % of mine sites in partially considered

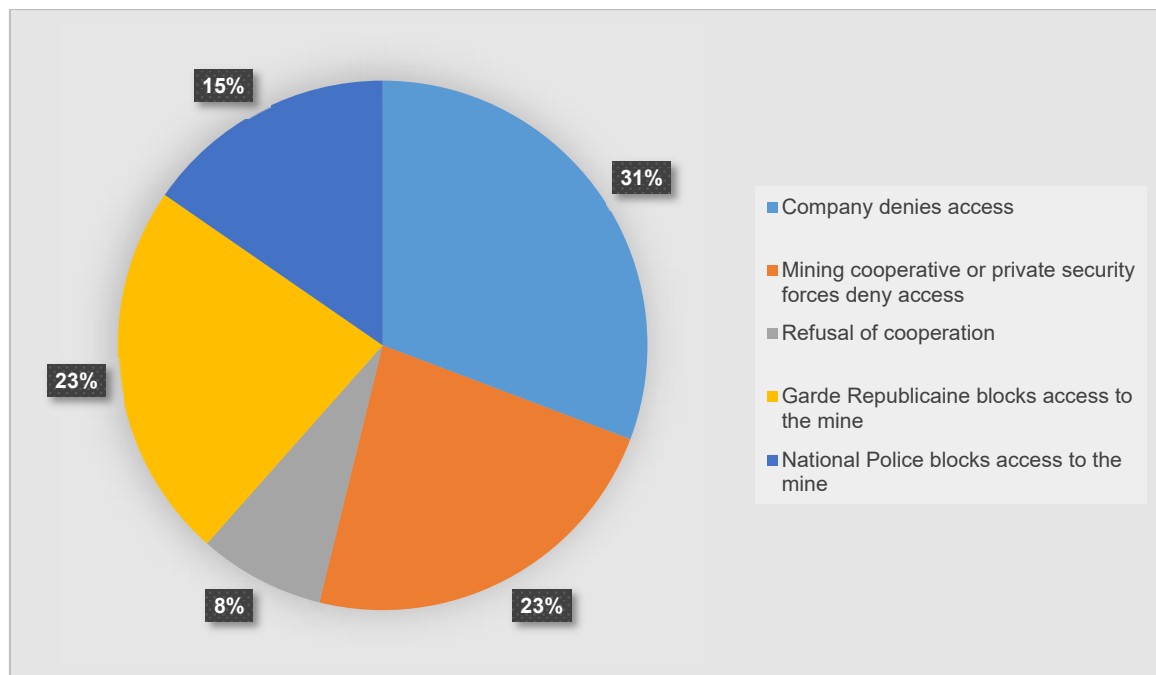


Figure 3 The figure shows the various reasons why access to the mines was denied to the field teams. The case where statements and data collection were refused but access was allowed was also considered inaccessible.

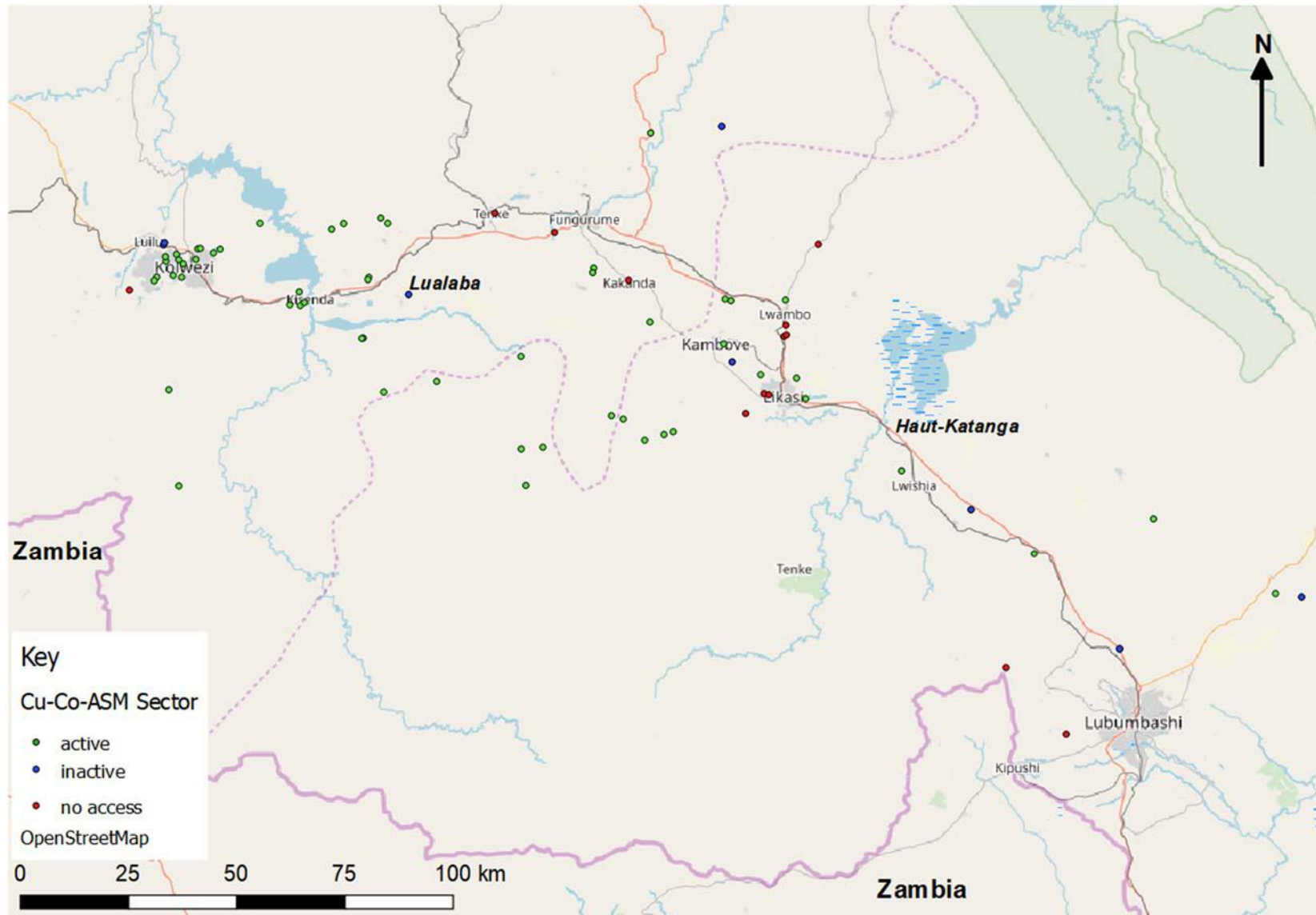


Figure 4 General map of the Congolese part of the Central African Copperbelt. The map shows the registered artisanal mines at the time of the mapping, including their status in terms of activity and accessibility.

5. Formalization perspectives of the artisanal copper-cobalt sector

5.1. Concessions

According to Congolese mining law (Journal Officiel 2018a & Journal Officiel 2018b), an artisanal mine is considered legal under the following conditions:

- Mining takes place in an ASM zone ("ZEA" zone d'exploitation artisanale) with a maximum area of two "carré" (1 carré = 84.95 ha).
- All miners working there are registered. They therefore possess a "carte d'exploitant artisanal" and are registered members of a mining cooperative.
- The cooperative can prove that it is registered according to OHADA law (2010) in the national Ministry of Mines ("arrêté ministériel national" as proof) and that it has been assigned to the ZEA.
- The cooperative has paid all taxes and levies related to the registration and also pays the annual flat rate tax of 10% of the turnover as well as the operation fee of the competent mining authorities.

However, there is a legal grey zone under Article 30 of the Code Minier, according to which an ASM mine may be operated within an existing license (PR, PER, PE) with the "express written permission" of the license holder. However, as the authorization is given, the license holder shall submit a renunciation of the area claimed by the artisanal mining cooperative, so that it is separated from the licence and transformed into an ASM zone. So far, only one case is known in practice where this article has actually been fully applied⁶.

Industrial mining companies are reluctant to adopt this approach for various reasons. Some fear that the juxtaposition of artisanal mines with their own concession could lead to access restrictions on the industrial concession being respected even less than before. Thus, through the intrusion of artisanal miners and persons performing "handpicking", an even greater risk for their own operations could be the consequence. Companies have paid license and transformation fees to the Congolese state for many years, these amounts are often defined according to the size of the respective concession areas. These investments would have to be declared as a loss, difficult to justify, if part of the area had to be surrendered. At the same time, by ceding these areas to artisanal miners companies would lose their opportunity to use legal levers against the presence of artisanal miners and cooperatives in the immediate vicinity. Investments in the protection of their own concession would have to increase further. The application of Article 30 is therefore associated with considerable risks for companies, especially for those that do not purchase artisanal production.

⁶Conversion of the former residential area of Kasulo from a Gecamines concession area to an ASM zone

Definition of legality of artisanal mines in the DR Congo

Reference of the criteria described here are the Code Minier and the Mining Ordinance (Règlement Minier) of the Democratic Republic of Congo, reformed in 2018.

Concession types

- PE Mining license for industrial mining
PR Exploration license independent of production type
PEPM Mining license for semi-industrial mining, mechanized small-scale mining
PER Mining license for tailings piles or so-called "artificial deposits"
- ZEA ASM zone, license for artisanal mining, mining cooperatives are allocated by SAEMAPE. The responsibility for supervision and inspection lies with the Mining Division and SAEMAPE.

Authorities

SAEMAPE

A technical public service with administrative and financial autonomy whose purpose is to support and monitor artisanal and small-scale mining.

Administration/ Division des Mines

Mining administration: All branches, departments and other public services in mining and quarrying.

Police des Mines et des Hydrocarbures

Special police unit specifically responsible for enforcing the law and maintaining public order on mines. The only armed state power allowed operating on mines.

Taxes

The tax legislation applicable to mining cooperatives is primarily laid down in Code Minier 2018, Article 262:

"The uniform tax rate for artisanal mining activities is set at 10% of the turnover resulting from the sales value of market products. The payment of the fixed tax exempts the holder from the payment of mining fees, mobile property taxes, income and profit taxes and the special tax on the remuneration of foreign employees. The fixed tax shall be payable at the time of sale."

Furthermore, the Mining Ordinance, Règlement Minier 2018, specifies the following regulation on taxes and levies of mining cooperatives, customs duties and value added taxes not taken into account:

Article 537:

- *The charge for issuing a miner's card "carte d'exploitant artisanal" (variable amount per province)*
- *Registration fee of a mining cooperative, single payment countrywide*
- *Annual advance payment of the fee for the extension of the registration as a mining cooperative.*

Article 542:

- *Tax for services provided, the exact calculation is determined by interministerial decision (mining and finance). The levy is divided 60-40 between SAEMAPE and the Governorate.*

Of the 79 mines to be considered, 68 are on industrial production licences (PE), four of which are in superposition with licences for the exploitation of tailings (PER). The state-owned mining company Gecamines is the owner of 38 of these titles, i.e. 56%. A further nine mine sites are located on licences which are also reserved for exploration or semi-industrial mining (PR; PEPM). Only three mines were registered within ASM zones at the time of the report, one of which was inactive and one other inaccessible (Table 2; Fig. 5).

Furthermore, six of these mines are located within residential areas of the cities of Kolwezi (3) and Likasi (3). Four other mines were located either in the immediate vicinity of residential areas of these cities or of villages.

Table 2 Summary of license holders and the number of artisanal mines on their concessions, separated by license types.

License type	License holder	Number of Mines Haut-Katanga	Number of Mines Lualaba
PE	Boss Mining	3	5
	Congo Dongfang Mining	1	
	Chemaf		1
	Compagnie Minière de Tondo	1	1
	Comide		2
	Compagnie Minière de Musonoie		1
	Congo Cobalt Corporation	1	
	Gecamines	22	13
	Goma Mining		2
	Kambove Mining	1	
	Kansonga Mining	1	
	Kamoto Copper Company		4
	Mutanda Mining		2
	Societe Miniere de Kasonta	1	
	Tenke Fungurume Mining		2
PE / PER	Chemaf / Societe Miniere de Kolwezi		1
	Gecamines / Metalkol		3
PEPM	Towards Sustainable Mining Entreprise	1	
PR	Compagnie Minière de Sakania	1	
	Générale Industrielle et Commerciale au Congo		1
	Ivanhoe		3
	Rubaco		1
	Societe d'Exploration Miniere du Haut Katanga	1	
ZEA		1	2

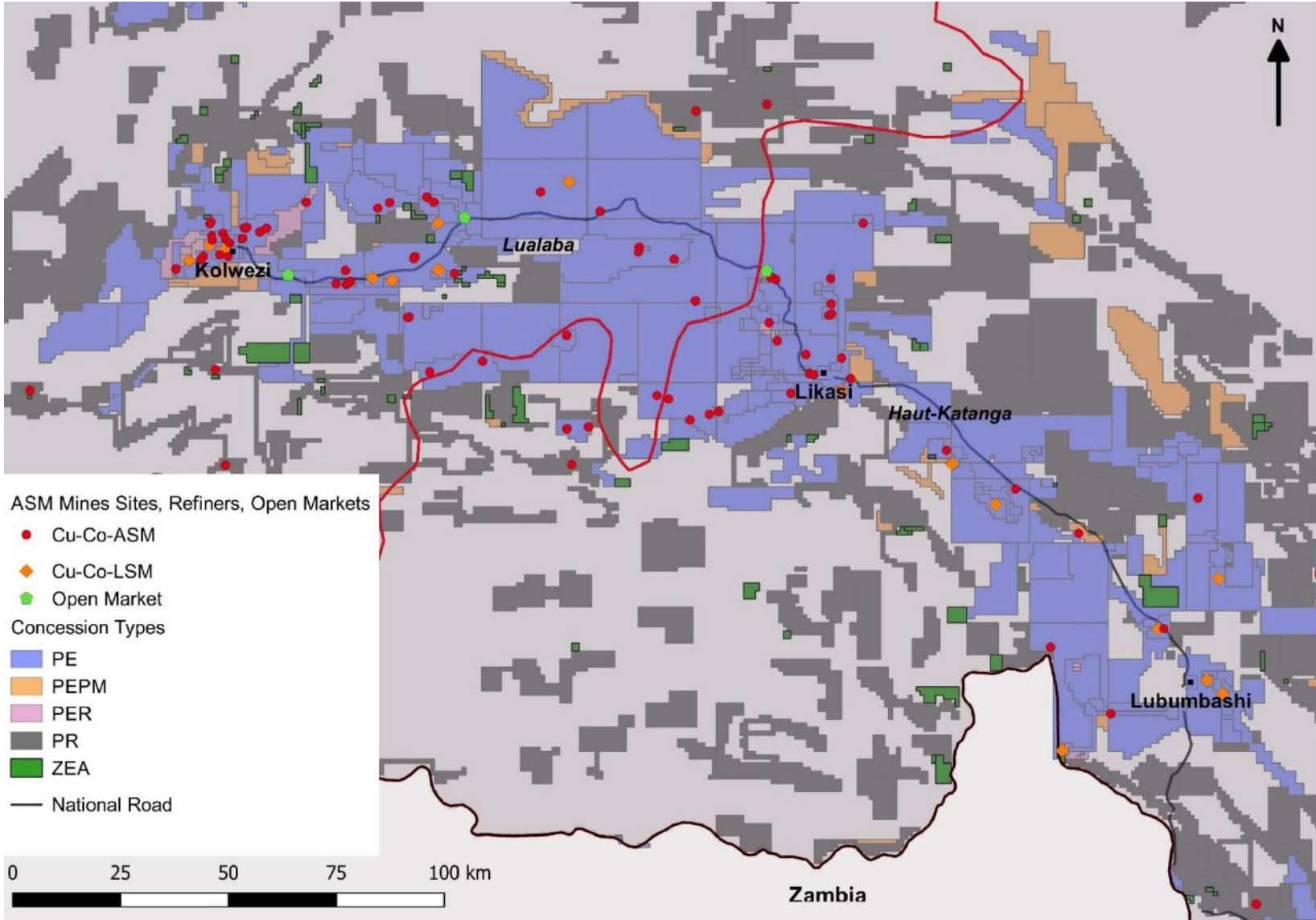


Figure 5 Concession Map of the Congolese Copperbelt. The map shows the widespread superposition of industrial production and exploration permits with artisanal mine sites in the provinces of Haut-Katanga and Lualaba.

The fact that there are only two producing mines in the concession types intended for artisanal mining is one of the main problems of the sector. The illegal nature of the majority of the artisanal mines gives buyers of the material negotiating leverage up to the point that they can dictate prices and threaten to shut down the mine. At the same time, this results in planning uncertainty for artisanal miners and cooperatives, which restricts investment in long-term structures. It is simply too risky to invest sustainably in the development of an artisanal mine (possibly up to the transformation to semi-mechanized mining).

In addition, individual exporting companies consciously accept the practice of informal mining and even theft by purchasing material of uncertain provenance, a responsibility that is passed then on to downstream companies in the supply chain.

The fact that ASM zones are currently located in less developed areas (in terms of existing mining infrastructure) and that cooperatives lack the knowledge and means to adequately explore and develop ore bodies, results in the unwillingness of most cooperatives to abandon industrial concessions and develop new mines in mostly geologically underexplored areas.

The unfavourable and possibly inadequate positioning of the existing ASM zones (there are currently 92 ASM zones in the Copperbelt) is also caused by the high number of large concessions historically acquired by industrial companies, mainly Gecamines and its JV partners. This circumstance is often referred to as "landgrabbing". The efforts of the provincial government of Lualaba to sustainably develop 12 new ASM zones for artisanal mining are to be welcomed as positive signals to challenge these issues.

The illegal character of artisanal mining in the Copperbelt continues to fuel disputes between concession owners and invading artisanal miners, where the right to protect company property meets the mainly poverty-driven motivation of miners to violate this right. It can be assumed that artisanal and small-scale mining in the Copperbelt will continue to exist in the next few years due to the current lack of alternatives and that it will take on new dimensions as a result of an expected-rise in commodity prices in the future. Therefore, the question of cohabitation between the industrial and artisanal sectors will have to be addressed.

A major problem revealed by the mapping was the non-existent or inadequate separation of living space and mining area, especially in the cities of Kolwezi and Likasi. This factor contributes significantly to the fact that children are present on mines or even work there. The extent to which the superposition or juxtaposition of workplace and living space affects health and society has been investigated in several studies (Decree et al. (2011), Pourret et al. (2016)). Stopping mining in residential areas is a major challenge on the path of responsible supply chains and can probably only be solved by resettlement or the widespread introduction of a non-corruptible traceability system at the point of extraction.

5.2. Organisation of artisanal miners

The presence of at least one registered mining cooperative in 35 out of 58 mines (60%) was observed. Among these 35 mines, five mines were registered where two cooperatives represent artisanal miners. There were 23 mines where no officially registered cooperative was present, on three mines unofficial miners' representatives, cooperatives or cooperative associations were found, of whom the legal status could not be verified or confirmed at the time of reporting (Fig. 7).

A total of 25 different mining cooperatives are active on the mines visited within the scope of the mapping, 17 of which are active on one mine each. Eight cooperatives are active on two to five artisanal mines (Fig. 6).

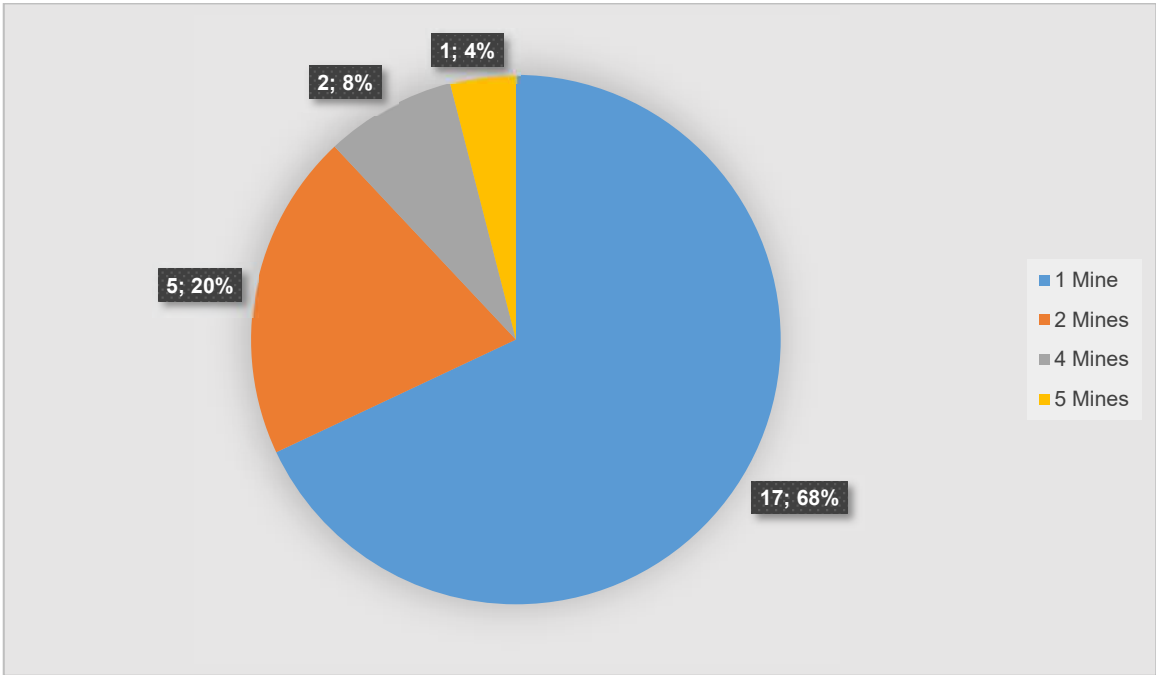


Figure 6 Outline of the number of mines on which identified cooperatives are active.

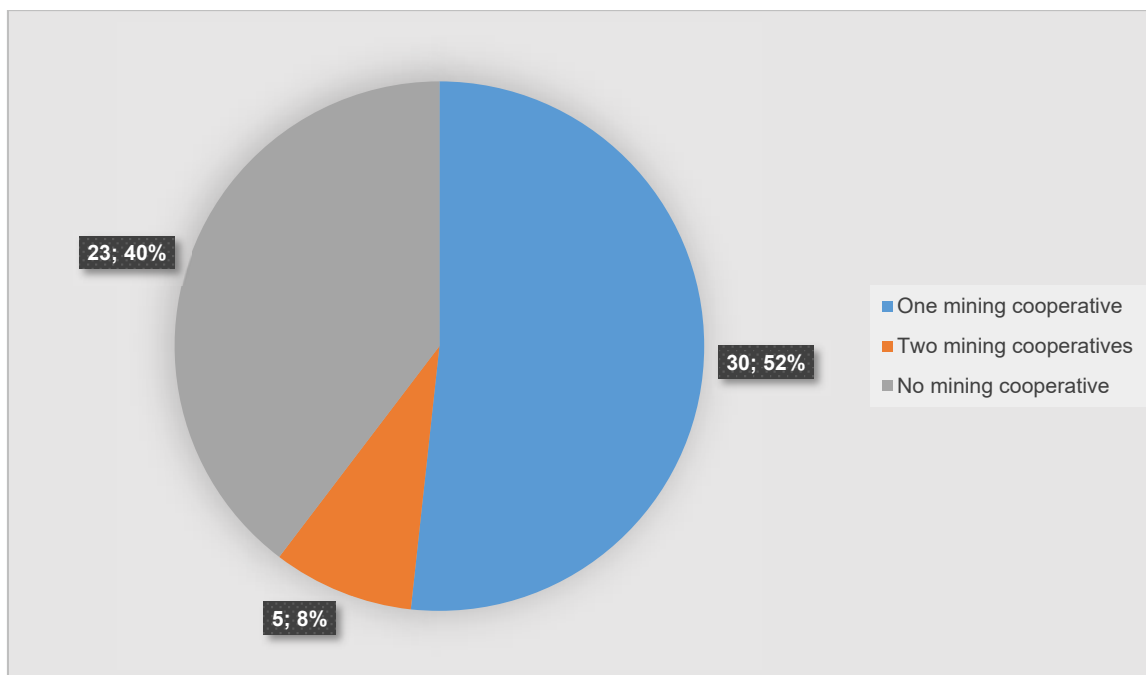


Figure 7 Overview of the presence of mining cooperatives on the mapped ASM mines in Southern Katanga.

As a result of interviews at 13 mines, it emerged that ten mining cooperatives had contracts with the license holder, who would approve of artisanal mining on their concession (Table 3). Only KCC explicitly denied the existence of contracts on request; the existence of the other contracts listed in Table 3 could not be verified with the license holders, the statements made on site therefore have to be questioned.

Table 3 This table lists the allegedly existing MoUs between license owners and cooperatives.

License holder	Mining cooperative	Mines	Relevant License
Gecamines	Cooperative A	1	PE 1077
	Cooperative B	1	PE 523
	Cooperative C	1	PE 530
	Cooperative D	1	PE 11600
	Cooperative E	1	PE 2604
Kamoto Company	Copper Cooperative E	2	PE 4960; PE 4963
Boss Mining	Cooperative F	1	PE 463
	Cooperative G	2	PE 469
Societe d'Exploration Miniere du Haut Katanga	Inofficial miners' group	1	PR 740
Chemaf	Cooperative H	1	PE 4631
	Cooperative I	1	PE 2604

It is estimated that at the time of the survey around 22,600 miners were working on mines where mining cooperative representation had been established. Exact information on how many of these miners are actually members of a cooperative or are even employed by it cannot be given. Another nearly 7,800 miners are organized either in loose, unofficial groups or not at all. Only on two mine sites, miners could show a registration card ("carte d'exploitant artisanal"), the majority of them were even unaware of the existence of this card. An estimated number of almost 500 miners work on these two mines.

In Congolese ASM (no matter which commodity), it is common practice for cooperatives, concession owners and companies that provide technical support for mining, and therefore are often business partners, to receive shares in the miners' production or income. In the artisanal mining of copper and cobalt, a similar picture has emerged:

On 16 mines, cooperatives receive a fixed percentage between 10 and 50% of the production revenue from the miners (11 mines: 10-20%; five mines: 20-50%). On two mines, the cooperatives receive variable percentages of the revenues (20-40 and 8-10%). Furthermore, cooperatives' representatives charge flat-rate fees on five mines, mostly per bag of ore (between 500 and 1500 CDF per bag). Another cooperative pays an indeterminable salary to the miners and collects the sales revenues from them. Other recipients of the miners' revenues were, on a case-by-case basis, the sponsor (one mine: 10%), the license holder (one mine: 10%) and a company (two mines: 20-30%). An unofficial miner grouping also receives a levy on a mine. At 29 mines, miners claim not to have to pay levies or contributions (Fig. 8). As a result, in two thirds of the cases where a cooperative was registered at the mine, the miners also had to pay contributions or levies to that cooperative. At this point, however, it should be noted that no distribution of income between miners - cooperatives - intermediaries / depot operators along the supply chain can be derived from these data, as the duties of cooperatives and traders were not surveyed during the mapping and therefore are largely unknown. After deducting the levies illustrated in Figure 8, the sellers' income is variably distributed among the respective pit team members.

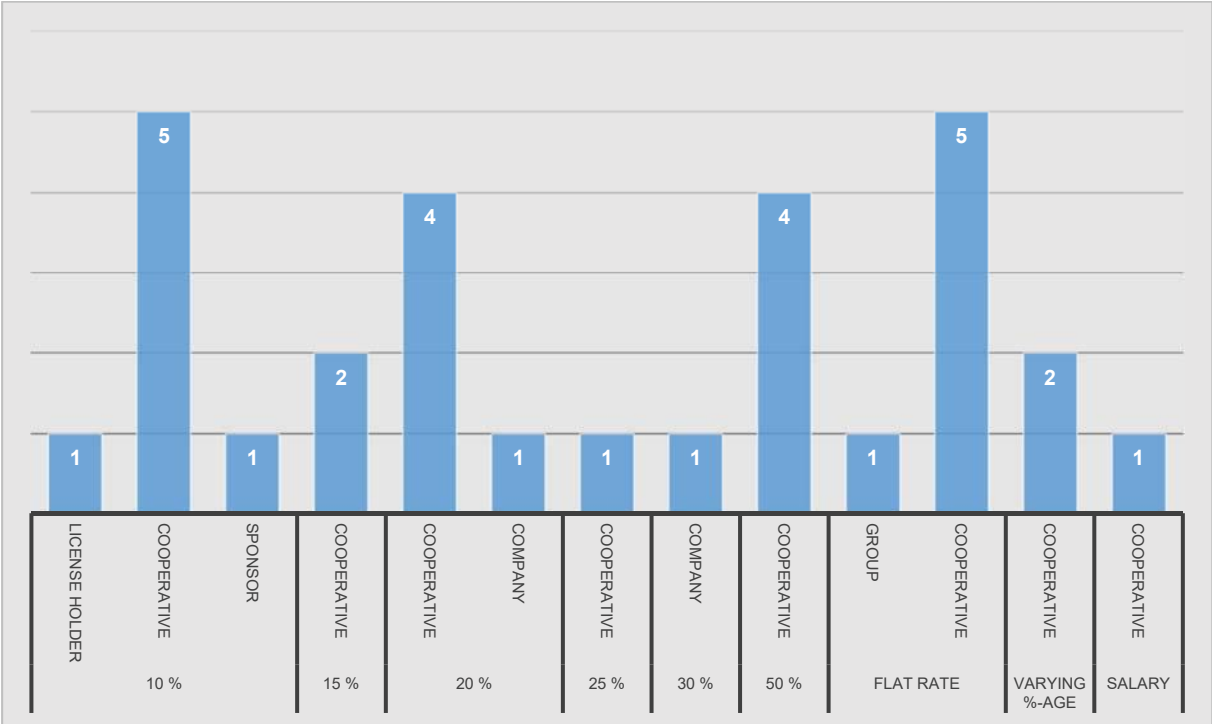


Figure 8 The figure illustrates a histogram of the levy distribution and policies described on site. The recipients of these levies as well as the respective percentages (of the sales value) or levies defined as flat-rate prices are displayed.

With regards to the degree of organization of artisanal miners, apart from the fact that not all mines have organized representatives, it is evident that the cooperatives found in this study hardly seem to perform their intended legal and social role. If one looks at the statements of the interviewed miners, one quickly comes to the conclusion that although the heads of cooperatives and their representatives demanded variable contributions, in many cases no

performance was visible that would justify that contribution. Workers are neither sensitised to occupational health and safety and hygiene to a sufficiently consistent degree, nor is appropriate protective equipment provided. The high number of accidents (occupational health and safety) reflects not only this shortcoming, but also the generally inadequate supervision and safety-related monitoring of mines. Compensation funds for the families of deceased miners and social projects in surrounding villages seem to be the exception rather than the rule.

However, it should be borne in mind that the skills and knowledge of the cooperatives are not sufficient, especially with regard to technical mining aspects. This, in turn, has its cause in the registration of new cooperatives approved by the Ministry of Mines without at the same time demanding proof of the competences required for carrying out mining activities⁷.

Furthermore, most cooperatives do not seem to fulfil their intended role in the supply chain either, as individual miners or pit chiefs, instead of cooperatives, sell production at almost all mines, often to varying buyers. Besides issues concerning traceability, the mining cooperatives do not seem to be involved in the negotiations between sellers and buyers. Negotiating prices collectively with intermediaries and depots was not found to be common practice. This was also reflected in the almost omnipresent complaints of the miners regarding the pricing policies and price dictates by buyers, which were perceived as unfair and intransparent.

5.3. Presence of state actors on artisanal mine sites

On 17 artisanal mines (26%), no unauthorized government officials were encountered nor was their presence confirmed by interviewees. On these mines only the presence of the legally required authorities (SAEMAPE, Division des Mines, Police des Mines) was observed, however only on seven (12%) out of these, all legally required government representatives were permanently, or on a regular basis, on site. This was also the case on 13 other mines, but there were also representatives of unauthorized officials present.

In total, on 24 mines (41%) military personnel or members of other police units than PMH were present; the presence of the “Garde Republicaine” on ten of these mines is remarkable. These are mainly located in the Kambove territory. Since in some cases the military wore no uniforms, the statements of the miners working there as well as the statements of the alleged soldiers had to be considered without further verification being possible. On the 14 remaining mines Congolese armed forces (FARDC) and/or national police (PNC) were present.

On 27 mines, persons present posed as members of one of the secret services (ANR, DEMIAP, Bureau 2) or were identified as such by miners. Both the secret service and the army were present on 16 of the mines.

No state authority was present on three mines, on three others, they could not be identified or the interviewees choose not to comment on this (Fig. 9).

⁷ Reglement Minier Article 32

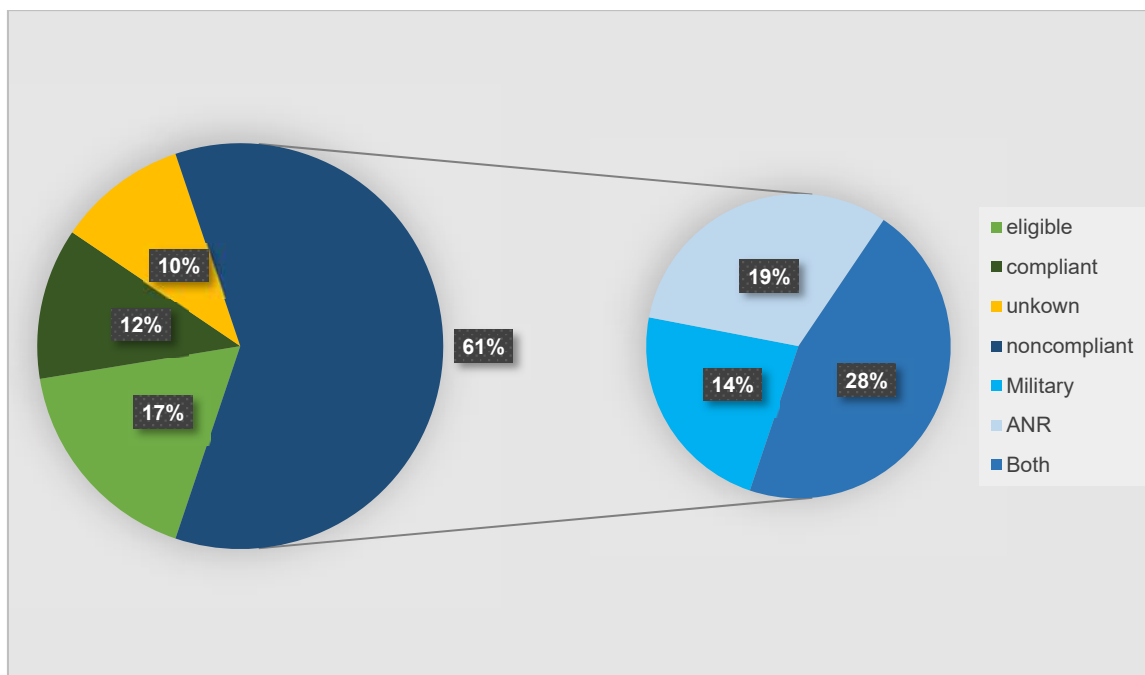


Figure 9 shows the evaluation of the mines with regard to the presence of state representatives. Here, "eligible" means that there were no illegal authorities on site, but not all necessary authorities were present. If all authorities are present, the criterion is described as "compliant".

In total, representatives of 16 different authorities could be identified (according to Code Minier three authorities permitted in artisanal mining). In addition to the military units and secret service organisations mentioned above, these include tax authorities, regional administrations, migration authorities and park rangers (Table 4).

Table 4 Summary of the diverse authorities found on the to be considered 58 mine sites. The authorities being legally required to be on artisanal mine sites are highlighted in bold letters.

Affiliation to ministries								
Mining	Defense	Interior				Finance	Env.	Justice
SAEMAPE	FARDC	PNC	DGM	ANR	ETD	DRHK	Garde chasse	Parquet
DiviMines	Garde Republicaine	PMH	DSF	Bureau 2		DRLU		
	DEMIAP							

The data collected on state presence on artisanal mines were also used to determine the extent to which the authorities responsible for monitoring artisanal mining cover the sector. A distinction must be made between the provinces and the SAEMAPE, DiviMines and PMH authorities due to the administrative division. Figure 10 shows the result with regard to the ASM mines to be considered. It should also be noted that for the thirteen mines that were not accessible to the field teams, this must also be assumed for the competent state authorities, since the same officials were also members of the field teams.

Two factors are relevant in the discussion about the coverage of the sector by responsible authorities, on the one hand that this requirement does not seem to be constantly and comprehensively fulfilled by the authorities, on the other hand that these authorities do not even get access to some mines, denied by military, companies or cooperatives.

Also, the discrepancy between the coverage derived from miners' statements regarding sensitisation and monitoring activities and the registered presence of the authorities (e.g. 28% of mines are sensitised by SAEMAPE, but SAEMAPE employees are physically present in 53% of mines) raises the question of whether the competent authorities have sufficient resources and individual employees have sufficient competence and professionalism.

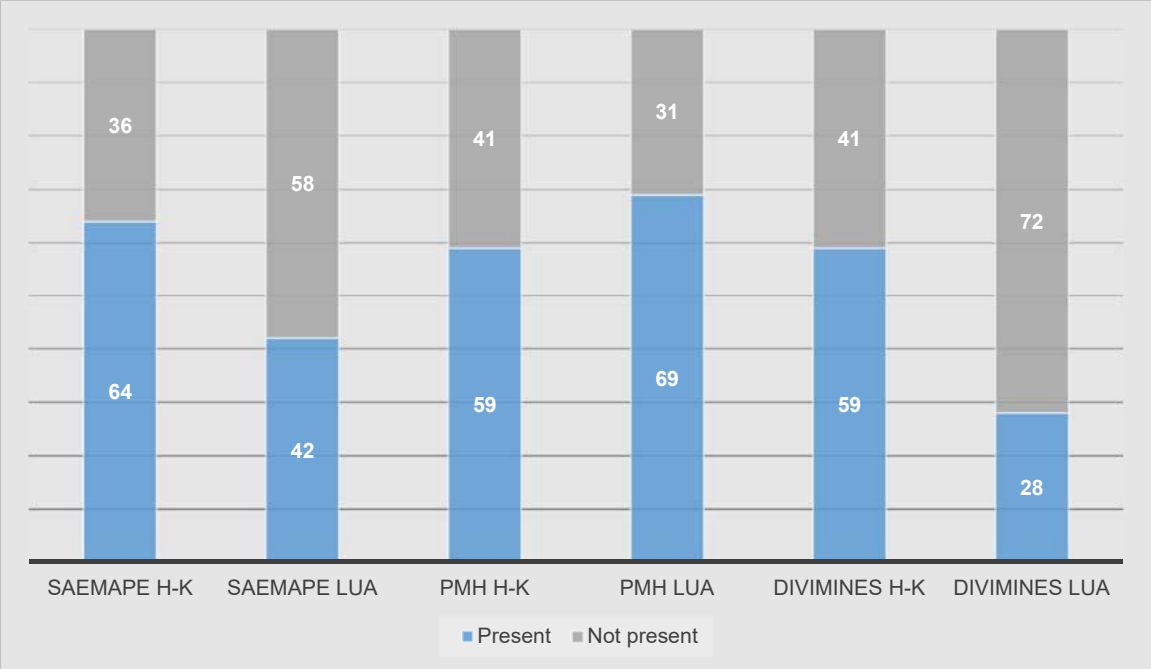


Figure 10 The coverage or presence of the responsible mining authorities SAEMAPE, Division des Mines and Mine Police (PMH) are stated per province in percent (H-K = Haut-Katanga; LUA = Lualaba).

Taxes and levies

On 35 of the 58 mines visited no taxes, neither official nor informal, were paid by the miners, and on one mine no information was given.

On 22 mines (38%), there are usually one or more barriers at the entrance to artisanal mines or on the access routes to them, where various representatives of the authorities, license holders or security personnel have to be paid variable levies per bicycle, truck or bag. According to miners, the levies vary between 500 CDF and 40,000 CDF depending on the means of transport and the representatives of the authorities.

Four mines also pay 'traditional' levies to the 'Chefs de terre', i.e. the local chieftains.

In general, there seems to be a multiplicity of authorities operating on and around mines. An insufficient knowledge of miners and cooperatives regarding their rights and fiscal obligations as well as mining law in general seems to tempt individual representatives to demand inadmissible levies. Since these taxes are not defined by law, the 22 mines mentioned above must be considered as non-compliant with current Congolese tax legislation.

6. Technical and economic conditions of artisanal mining

6.1. Production and processing of copper and cobalt ore

The estimated monthly production at the time of mapping (April and May 2019) is approximately 10,000 tonnes of raw copper ore and 24,800 tonnes of raw cobalt ore with highly variable metal contents. These estimates are based on field team observations and statements of interview partners. At some mines, documents from cooperatives or government agencies, such as statistics or tables, regarding production were available for consultation. In most cases however, no documents existed if production was not purchased on site, or access was denied.

The average stated metal content is 13.6 % for copper and 4.2 % for cobalt on geometric average. Maximum cobalt contents amounted to 23%, minimum contents accepted for purchase amounted to 1%. For copper, the maximum is 34% and the minimum is 3%.

Information on copper contents was provided at 44 mines of the 49 copper-producing mines, and at all 35 cobalt-producing mines on cobalt contents respectively. At five copper producing mines it was reported that copper was mined and sold, yet metal contents were not reported. Only in one case, it was possible to get hold of a document giving content information, in the other cases the statements by miners and depot operators were registered. For each mine, an average from the indications given in variable numbers by the miners and buyers was formed by the field teams and then registered in the database.

However, it should be borne in mind that the mean metal contents indicated are mainly derived from the statements of miners, who themselves refer to the results of the spectrometers of the depot traders, who in turn are suspected to manipulation of the spectrometers. The reliability of that data is therefore regarded as low.



Figure 11 The photographs show typical copper-cobalt ores (copper top left, cobalt top right) which are mined near the surface in small mines and then are filled, partly unsorted or unprocessed, into bags which are stored on the mine until transport.

By summing up the monthly production of copper and cobalt and taking into account mean metal contents of 13.6 % copper and 4.2 % cobalt, this would simply add up to an annual production of approx. 16,300 t Cu Cont. and approx. 12,500 t Co Cont. from the 58 mine sites. Since this calculation is by no means accurate, production figures are often based on information that has not been documented and averaged metal contents harbour a high degree of uncertainty, a more cautious, lower estimate of artisanal production for 2019 should be made. In addition to these factors, seasonal fluctuations and the intervention of the military on some concessions to prevent artisanal production or theft also play a role. Seasonal fluctuations in this case mean the closure of various mines due to flooding caused by the rainy season and increased risks regarding rock stability. Also, the resumption of agricultural activities due to seasonal climate fluctuations, and thus the creation of alternative income, is a factor that is likely to fluctuate the monthly production of artisanal copper and cobalt. This fluctuation has already been expressed during the mapping, in April three mines were still flooded and thus inactive due to the last heavy rainfalls, in May no mines were inactive for this reason.

A decline in cobalt production from Congolese ASM can be expected for 2019 compared to production in 2016 to 2018 due to much lower global cobalt prices. CTCPM⁸ reported an official artisanal production of 17,960 tonnes of cobalt in 2018.

As a result of the imminent suspension of the activities of Mutanda Mining , the operational risks for KCC (interim moratorium due to increased radiation values) and TFM (production difficulties) as well as the generally difficult economic situation in view of falling commodity

⁸ Presentation of CTCPM at the Cobalt Conference Hong Kong 2019

prices and increased taxes, a decline in industrial cobalt production can also be expected for 2019. The relative share of artisanal cobalt will therefore continue to amount to 15 to 20% of total production (Table 5).

Table 5 Table showing copper and cobalt exports from DR Congo (Ministère des Mines 2016-2018), furthermore the estimated () shares of ASM and resulting LSM shares of cobalt exports are given. The estimated value is always about 15% of the total (2016 & 2017) or the extrapolation of the information obtained from this mapping project (2019).*

Year	Copper exports [t Cont.]	Cobalt exports [t Cont.]	ASM Cobalt [t Cont.]	LSM Cobalt [t Cont.]	Factors impacting ASM- Production
2016	1023687	68822	10300*	58522	Low commodity prices relatively unattractive
2017	1094638	82461	12300*	70161	Rise in Cobalt-prices triggers increase in ASM mining and migrational fluxes towards the Copperbelt
2018	1221648	111358	17960	93398	Cobalt-price peak, short term boom of the Congolese Cu-Co-mining sector
2019			12500*		Co-prices hit three year low & disputes between artisanal miners and mining companies cause a decrease in production

As far as copper production is concerned, a higher share of total production is to be expected due to the focus of mining and sales on copper ore, at least where it is possible. Nevertheless, the production share of artisanal copper remains extremely low in comparison to the total annual Congolese production of industrially mined copper. By comparison of the estimated annual production of 16,300 tonnes for 2019 with the 2018 official statistics of the Ministry of Mines regarding exported copper production, namely 1,221,647 tonnes of Cu content, the relative share amounts to slightly more than 1%, assuming that copper production in 2019 reaches similar dimensions than in 2018. Statistics or estimates of artisanal copper production in 2018 and earlier could not be consulted for comparison.

During mapping a total of ten cobalt-producing mines and 23 copper-producing mines were registered. An additional 25 mines were registered, where both metal ores were extracted (Table 6).

Table 6 Number of mines primarily producing copper, cobalt or both. Furthermore, it is indicated if and which by-products are mined.

[Number of mines] Primary production	By-products	Province	
		Haut Katanga	Lualaba
Cobalt	Iron	-	1
	-	2	6
	Gold	1	
Copper	Iron	-	1
	-	14	7
	Gold	1	
Copper-Cobalt	Manganese		1
	-	4	17
	Gold	-	3

Eight of these mines also produced other metals as by-product (5 gold, 2 iron, 1 manganese Fig. 12). For gold, iron and manganese neither production nor ore grades could be obtained.

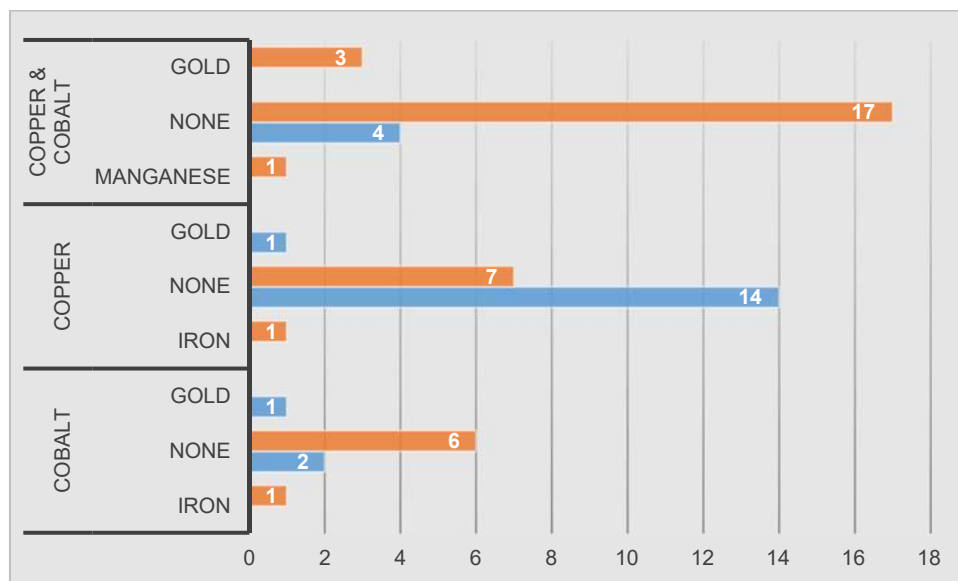


Figure 12 Number of copper-cobalt mines producing by-products in the provinces of Haut-Katanga and Lualaba.

Processing

In order to estimate the degree of processing of the ore mined at the respective mines, the field teams checked for existence of the following rudimentary processing steps:

- Crushing
- Washing
- Separation
- Screening

If only crushing and/or washing was carried out in a mine, the ore subsequently sold is classified as crude or unprocessed because it is assumed that the concentration due to the washing process is insignificant, although technically it is already a processing technique.

If either processing throughout screening and/or separation took place, the ore is then classified as pre-concentrate. If both steps were carried out, the corresponding production is classified as concentrate. It should be noted that the classification used is not the same as a subdivision based on metal content. The analysis of the content data, which were mainly provided by the miners selling the products, did not reveal any correlation between the degree of processing and the metal contents analysed at the time of sale (Fig. 13). A total of eight mines sold raw ore, 17 pre-concentrates and 33 concentrates.



Figure 13 Processing techniques for copper and cobalt in Congolese artisanal mining. Washing and crushing processes as well as the sieving of previously washed ores can be seen.

After processing, the overburden and waste rock is dumped without any consideration. Systematic storage or the use of overburden for backfilling inactive tunnels or shafts was not found at any mine site. This lack of planning means that it will no longer be possible to process economically significant (due to raising prices or more efficient processing techniques) tailings at a later stage, as nobody knows what material was dumped where exactly. It should be noted that material with a content of less than 1% cobalt and less than 3% copper is rarely purchased. It can therefore be assumed that theoretically, economically relevant tailings are not available for large-scale processing (see projects on the processing of old tailings and waste piles RTR Metalkol and STL).

Pricing

Prices for copper and cobalt ores are usually determined by analysing a representative sample of the delivered concentrate using a portable spectrometer for X-ray fluorescence analysis. In 69 % of the cases, the price is calculated based on metal content in combination with the weight determined by the scale, while prices for different grades are listed on a price chart (see Fig. 14). On one mine site no information could be obtained, on 17 mines there was no price chart. According to the miners, the price charts are drawn up by the buyers, in 10% of the cases the actual LME price is used for orientation; otherwise the prices are dictated by the buyer without reference. Thus, on 47 of the 58 mines to be considered (81%) the buyer was indicated as the price-determining party, only on five mines the possibility of negotiation was indicated, on another mine a fixed price without content determination and price orientation is paid. For a total of five mines, no further details could be given on price determination.

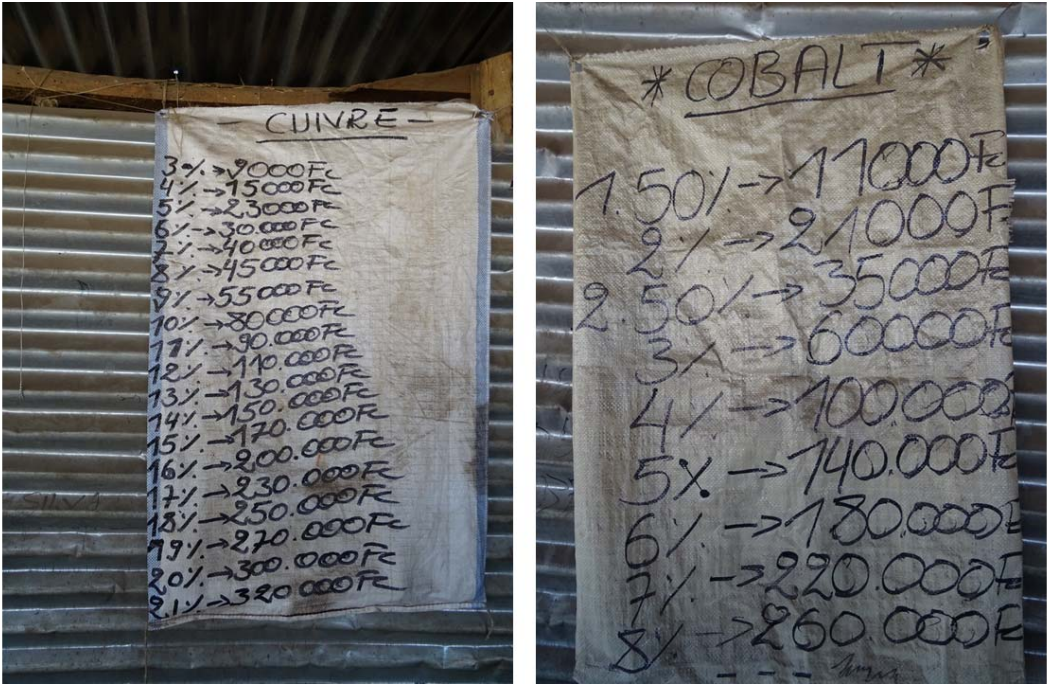


Figure 14 Price tables at depots which show purchase prices for copper and cobalt ores depending on the respective metal content.

As to the question whether there was a contractual basis between the seller and the buyer, no information was given on 14 mines. 36 mines were not covered by a contract according to the sellers, mainly miners, however eight mines were presumably covered by a contract. Further details could not be learned.

6.2. Supply chain

As both surveys and observations refer to the production of the mines and their first sale, mostly on site, a complete and comprehensive supply chain description cannot be given.

At this level of the supply chain, a total of seven different types of actors could be identified and classified into different levels with regard to their proximity to the final exporter from the DR Congo. For this purpose, 4 supplier or tier level including any modifications on the same hierarchy were defined (Fig. 15).

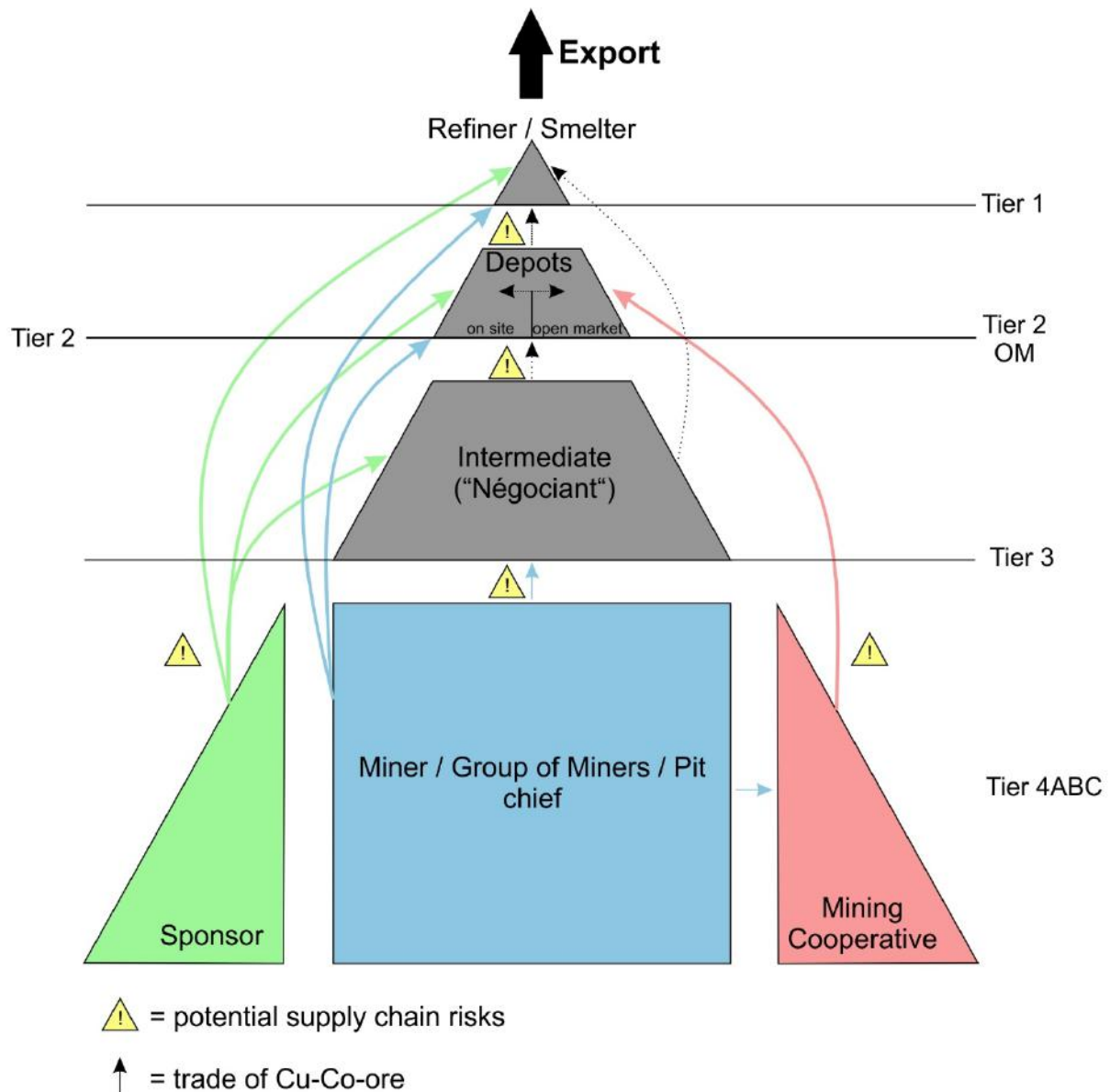


Figure 15 Supply chain pyramid and tier level in relation to final exporter from DR Congo. The different types of actors in the domestic supply chain are given. The various types of actors in the Tier 4 level, which is the focus of this study, are shown in colour. The arrows represent possible trade relationships between actor types, and for all trade relationships the possibility of existing risks with regard to compliance with due diligence requirements is displayed.

Description of the actors found in the copper-cobalt supply chain

Tier 4: sellers at mine level

Tier 4A: Miners / pit teams / pit chiefs

The miners in artisanal and small-scale mining are mainly organized in groups. These groups can be loose structures or families. Usually there is one miners group per pit, tunnel or shaft, headed by a pit chief. Usually the head of the pit or shaft regulates the sale of the daily production and splits the revenues.

An individual miner must have a miner's card ("carte d'exploitant artisanal") registered in his name and be a registered member of a mining cooperative. Neither individual miners nor pit chiefs have the right to transport or to commercialise raw commodities.

Tier 4B: Sponsors

In Congolese artisanal mining, it is common for individual pits or tunnels to be pre-financed or equipped by different individuals who are not themselves actively involved in mining. In return, there are agreements between the working mining team and the sponsor, be it revenue sharing or the exclusive purchase right of the production. For the sponsors this is a form of investment, for the mining teams it is a possibility to cover capital and operating costs.

The concept and role of the sponsor is not defined in the mining law nor the mining regulation of the DR Congo. The extent to which their involvement in mining is permissible depends on the status of each individual (e.g. politician, military employee, businessman, etc.) and, in the event that they themselves trade the product they pre-financed, the need also registration as traders.

Tier 4C: Mining Cooperatives

Mining cooperatives are responsible for the supervision, care and training of their members. Registered mining cooperatives assigned to an ASM zone with a maximum of two carrés are entitled to sell or trade commodities within the DRC. For this purpose, the trading partners (processors, intermediaries) must be registered, a request for authorisation of the processing must be received by the Ministry of Mines on the part of the mining cooperative and the processor must also be registered⁹.

Tier 3: Intermediates / „Négociants“

In the Congolese context, the intermediaries referred to as "négociants" are usually individually acting mobile buyers of ores and precious metals. In general, this definition is based on the assumption that the intermediary buys produced minerals directly on a mine. Oftentimes unwritten or unofficial agreements between miners or cooperatives and these intermediaries form the basis of business. These arrangements often take the form of pre-financing or the provision of materials (tools, pumps, means of transport).

Intermediaries therefore have an important role to play in the microeconomic dynamics of artisanal mining. Through their pre-financing or provision of materials, intermediaries make it possible to compensate for fluctuations in miners' production and hence income and thus guarantee that mines can be run long-term. As intermediaries often transport and accumulate economically relevant tonnages for regional processors, they represent an important link in the domestic supply chain. At the same time, their role in the supply chain is often criticised, as their business appears arbitrary and many trade relationships and transactions are informal. Their elimination, as is often internationally demanded, would probably result in a vacuum with regard to transport, accumulation and prefinancing, which could probably only be compensated by the direct purchase of domestic refineries and smelters at the mine site, as well as the handling of all logistical expenses.

⁹Code Minier Articles 110 to 115 & Règlement Minier Article 233, 238, 258

Under applicable mining law, intermediaries must be of Congolese nationality and hold a merchant license that defines the purchase right for certain ASM zones. Only they are authorised to transport artisanal minerals. They are also required to report¹⁰.

Tier 2: Depots on the Mine

In the Copperbelt, the warehouses that purchase artisanal production are referred to as "depots" (Fig. 16). In Congolese mining law this term does not exist, only "entités de traitement (treatment center)" exists for 3T and copper-cobalt as well as "comptoir (trading house)" for gold and diamonds. Through mineralogical or metallurgical techniques ores are processed into concentrates. Like intermediaries, depots are subject to reporting and taxation.

Registered depots may purchase artisanal production from cooperatives and intermediaries, but not from individual miners, unless they officially represent the cooperative¹¹.



Figure 16 Depots on artisanal mine sites. Here, the production of the individual pits is purchased, partly further processed and temporarily stored until transport.

Tier 2 OM: depots on the open market

In addition to the depots and warehouses existing directly on or near the mines, at the time of the mapping there were three larger operational open markets, which require transport from the respective mines to these marketplaces. These open markets are to be understood as agglomerations of depots where a sale takes place without contractual conditions or knowledge of the ores' origin (Fig. 17). The depots located there are usually registered and process the purchased ore mechanically.

Both Tier 2 and Tier 2 OM actors generally do not have the technical capacity to process copper and cobalt ores pyro- or hydrometallurgically and thus do not fulfil the legal basis to export the purchased raw materials¹².

¹⁰Code Minier Articles 26, 115 to 120 & Règlement Minier Articles 242 to 250

¹¹ Règlement Minier Article 258

¹²Arrêté interministériel n°0945/CAB.MIN/MINES/01/2015 et n° 329/CAB. MIN/FINANCES/ 2015 du 31 décembre 2015 modifiant l'Arrêté interministériel n° 0122/CAB.MIN/MINES/01/2013 et n° 782/CAB.MIN/FINANCES/2013 du 05 avril 2013 portant réglementation des exportations des produits miniers marchands & Arrête interministériel n° 0122/CAB.MIN/ MINES/01/2013 et n° 782/CAB.MIN/FINANCES/2013 du 05 avril 2013



Figure 17 Open market of Musompo, only the outer walls of the depots can be seen.

Tier 1: License holders, refineries and smelters, exporters

Most license holders produce on their industrial mine sites and own their proper plants for the hydro- or pyrometallurgical processing of copper and cobalt ores and are also listed as "entité de traitement". These companies usually represent the last link in the domestic Congolese copper-cobalt supply chain. With regard to the artisanal supply chain, it can be assumed that some Tier 1-level actors also process and export it together with industrially mined ore so that mixing occurs.



Figure 18 Final products of the intra-Congolese value chain or supply chain. Left cobalt hydroxide, right copper cathodes. These products are manufactured using hydrometallurgical processes that are energy-intensive, require the use of chemicals and technical know-how.

According to Congolese mining law, only Tier 1 and Tier 2 level players are eligible for export, but since in the case of Copperbelt Tier 2 level actors, i.e. depots, do not have the technical capabilities, export is mostly limited to Tier 1 level¹³.

¹³Code Minier Articles 5 & 27

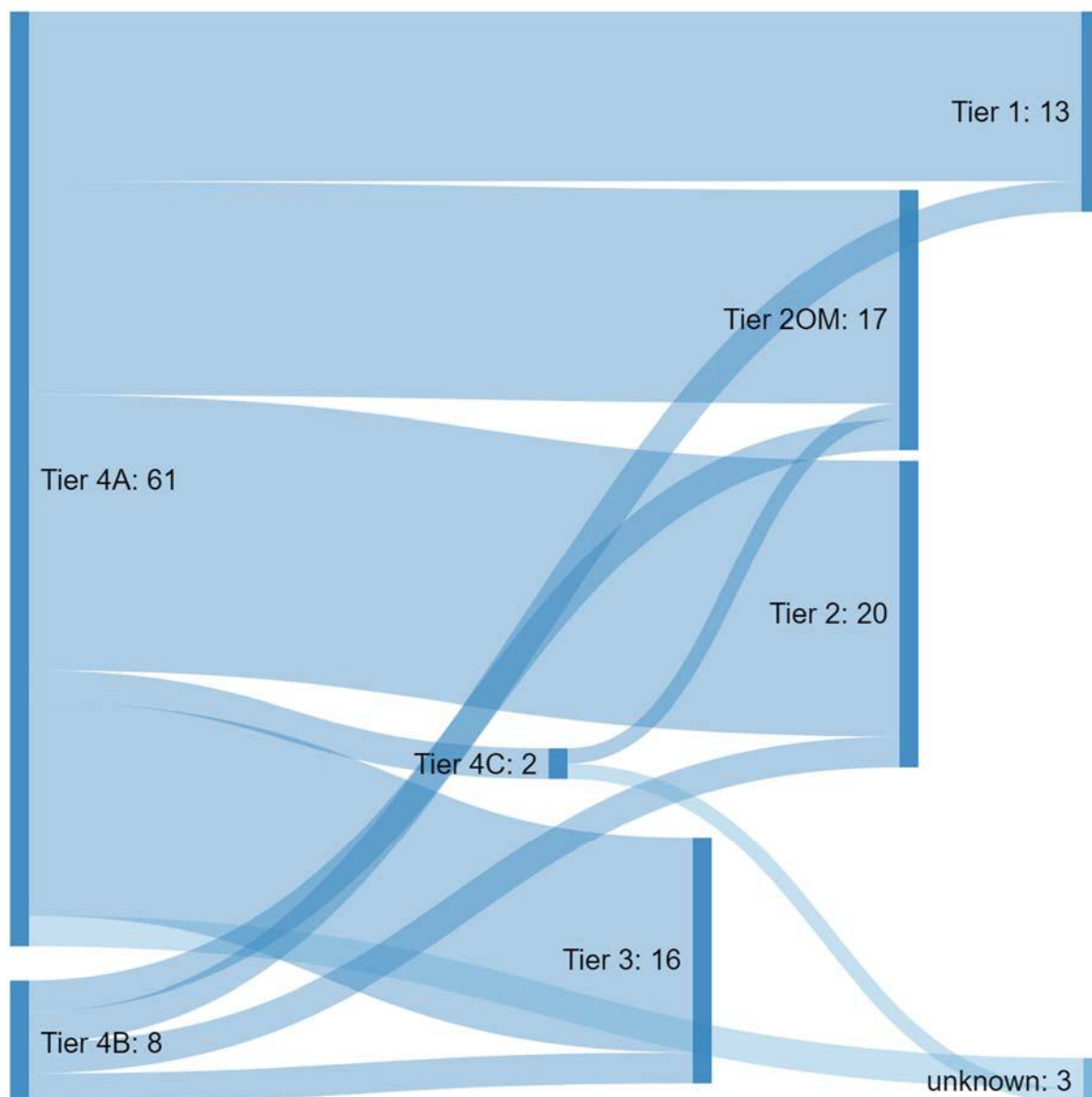


Figure 19 Sankey Diagram to show the share of each actor type in the trade relations found in the course of the mapping. Here, Tier4A actors, i.e. individual miners, represent the majority of sellers, with the counterpart's share being less concentrated on the 4 actor types of the higher supply chain levels and more evenly distributed. The thickness of the individual connecting curves represents this circumstance. The definition of tier levels can be found in the text.

Number of actors

The field teams identified 69 different parties by name or signs or logos as buyers of artisanal copper and cobalt. These included nine exporters (Tier level 1), three cooperatives (Tier level 4C), two companies listed as concession holders and three unknown companies, which were not listed in the export statistics in 2018. A total of 52 depots and intermediaries make up the majority.

In addition, with regard to the first sale, 71 trade relationships were identified between the defined types of actors. In 61 of these relationships, the miner or the pit chief takes on the role of the seller, only in two cases a cooperative declared itself the seller and in eight others the sponsor of the mine. (Fig. 19). In two cases, miners indicated that they were selling their

production to the cooperative present at the mine, but the cooperatives' respective trading partners were not disclosed in one case. In 16 cases, buyers are mobile intermediaries, in 22 cases depots buy raw materials directly at the mine site. In 17 cases, however, sales to depots in the open market were reported, with the purchasing parties being regarded as freely selectable by the sellers. In 13 cases, raw materials were purchased by agents who could be directly associated with Tier 1 level actors, i.e. exporters. On two mines, on the other hand, no information was provided by miners regarding a buyer (Fig. 19).

This suggests that in the case of 56 trade relationships, the exporter is not known. If this is related to the mines to be considered, this means that for eight mines the exporter is known, for another four the exporter is partly known and for the remaining 44 sites unknown.

The analysis of the first link in the inner-Congolese supply chain has shown that, at the time of the mapping, traceability of the origin and thus of the conditions prevailing on the respective mine sites could not always be given. Also, the origin of ores cannot be verified by selling them on open markets.

However, it should be noted that the open markets Mulungwishi and Kisanfu were closed between the time of the mapping and the time of the publication of this report, and that existing depots were destroyed. The province of Lualaba has also begun the construction of a central trading centre ("centre de négoce") for artisanal copper-cobalt ores. However, it is unclear where the ores, which were previously traded on these open markets, will be sold in the interim until the centre opens. Depots on the mines themselves seem not to be affected so far. Direct purchase on and marked transport from the mine site appear to be the easier way to achieve a more transparent supply chain and may be preferable to bundling production after the first transport, which carries contamination risks.

The extent to which the depots or intermediaries identified and classified as buyers are entitled to purchase artisanal production cannot be assessed in the context of this project due to the limited scope. With regard to the selling sponsors, however, there are doubts as to their eligibility.

In addition, since individual miners or pit chiefs were usually identified as sellers instead of cooperatives, this means that, according to mining law, unauthorised persons are involved in the sale of copper and cobalt ore, especially since a significant proportion of the mines investigated did not have cooperatives that could represent miners in the trade.

Regarding that some well-known companies that export copper cathodes, cobalt hydroxide and concentrate buy ore mined in artisanal mining and mix it with ore from other sources, it is unclear to what extent these companies communicate this to their international customers or even report it in their production and export statistics.

Nationalities

With regard to the question of the nationality of the trading partners, the situation at the time of the mapping showed as presented in Fig. 20. Since in some cases multiple trading partners were found per mine, the percentage does not refer to the 58 mines to be considered but to the total number of buyers mentioned.

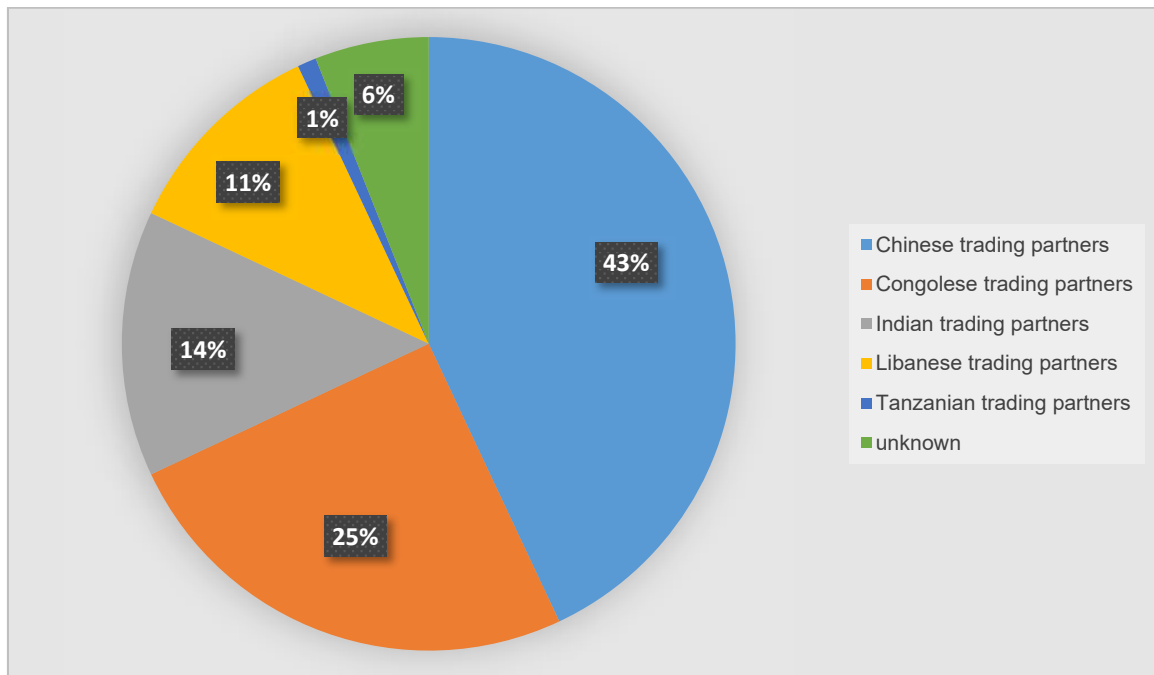


Figure 20 The pie chart shows the specified nationality of the trading partners, i.e. buyers of artisanal production. The majority are Congolese and Chinese intermediaries and depot operators (almost 70 %).

7. Risk assessment of the sector

7.1. Socio-economic risks

Income of miners

A total of 240 miners at 52 of the 58 mines to be considered wanted to provide information on their daily incomes.

Several salary levels were defined to classify the data (Tab. 7), the threshold of the lowest salary level being the Congolese legal daily minimum wage called "SMIG"¹⁴ (4.2 USD or 7,075 CDF).

Table 7 Summary table of the stated daily incomes, classified according to Congolese minimum wage and subsequent 5-dollar increments.

	Daily income [CDF]	Daily income [US Dollar]	Number of Miners	%	mean [CDF/USD] <small>(without 11 extrema)</small>	Mode [CDF/USD]
Below national minimum wage	<7.075	4,2	97	40,4	12.950 / 7,65	5.000 / 2,96
7075-16400		4,2-10	68	28,3		
16400- 24600		10-15	23	9,6		
24600-32800		15-20	25	10,4		
32800-41000		20-25	5	2,1		
41000-49200		25-30	0	0		
49200-57400		30-35	11	4,6		
57400-65600		35-40	3	1,3		
65600-73800		40-45	2	0,8		
73800-82000		45-50	1	0,4		
>82000		>50	5	2,1		
Total			240	100		

40% of the artisanal miners surveyed say they earn less than minimum wage, 28% earn between the fixed minimum wage of \$4.2 and \$10 a day (Fig. 21). Therefore, just over two-thirds of the miners surveyed earn less than \$10 a day, with working hours and the type of work being very variable and not classified here. If the 11 salary figures of 35 to over 50 USD are not taken into account, the average daily income is 12,950 francs or the equivalent of 7.65 \$ (Table 6).

¹⁴ Ordonnance n°08/040 du 30 avril 2008 & Journal Officiel numéro 11 du 1er juin 2018 a publié le Décret n°18/017 du 22/05/2018 portant fixation du nouveau SMIG.

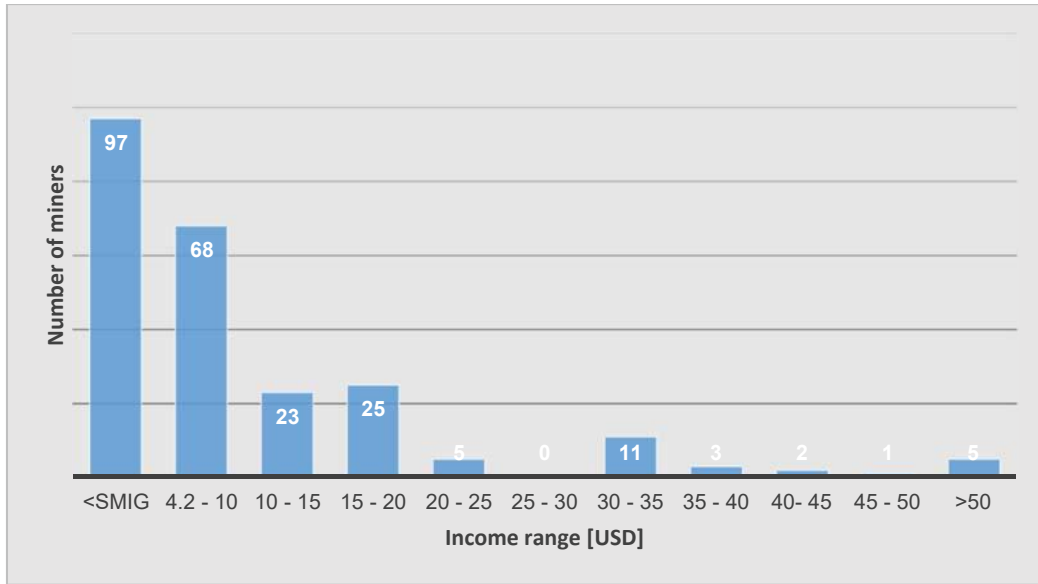


Figure 21 Histogram of the income distribution of artisanal miners in USD.

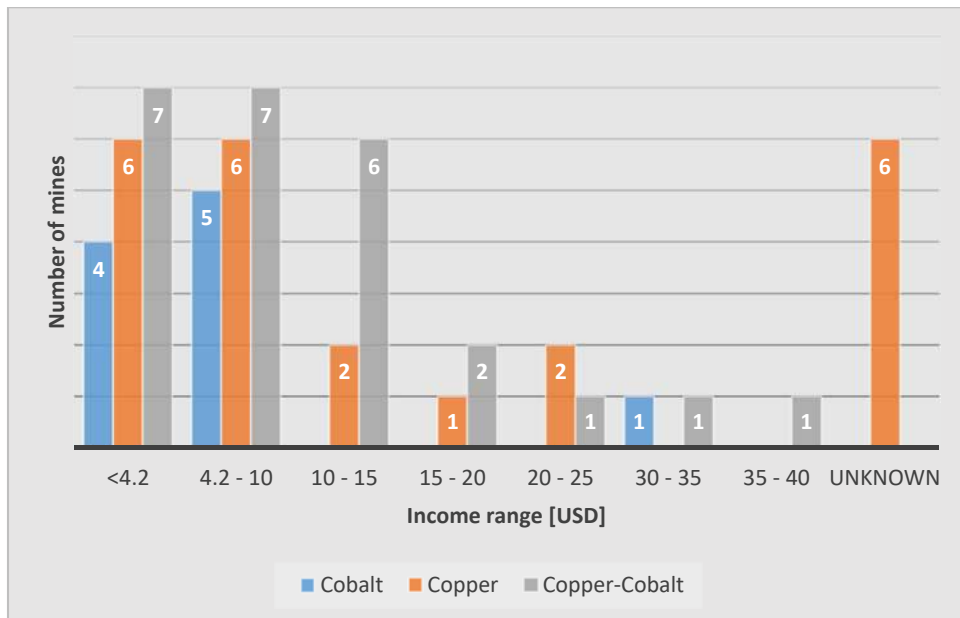


Figure 22 Histogram of the average income at the respective mines as a function of the raw materials mined there.

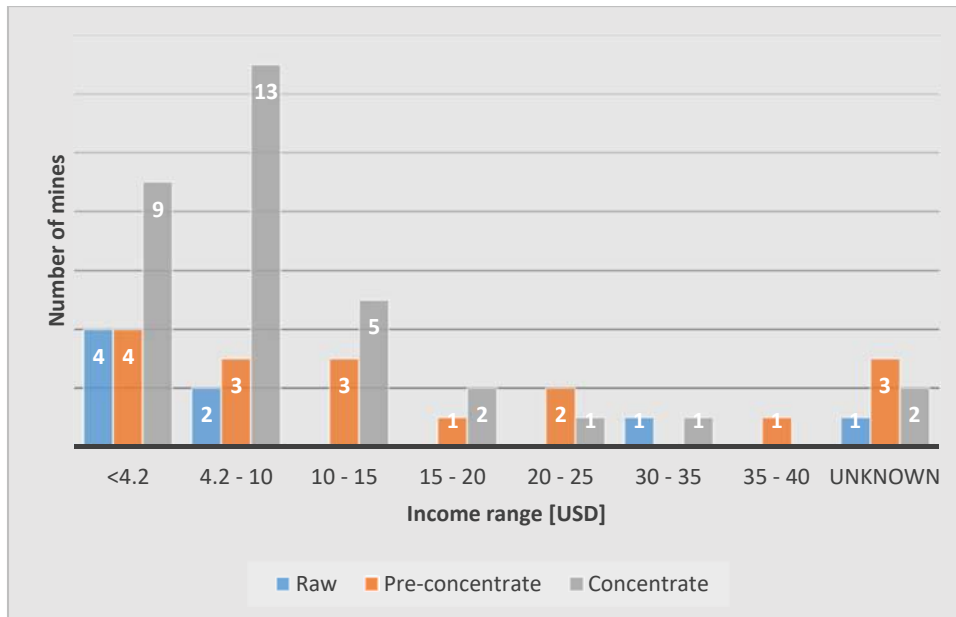


Figure 23 Histogram of the average income on the respective mines depending on the processing that takes place there and thus on the product type.

There are no differences in income depending on the commodities traded; however, the degree of processing shows a minor effect on the miners' income when comparing unprocessed raw ore with concentrate (Fig. 22 & Fig. 23).

The miners stated that the income was mainly used to cover the living costs and the tuition fees of their children. At 19 mines individual miners stated that they also saved money for various investments (house purchase, motorbike purchase, car purchase, marriage, small trade on the side, agriculture, improvement of raw material transport), whereby no relation could be established between the ability to put money aside and the amount of the daily income stated.

Women in artisanal mining

Women working in the mine sites were found and interviewed on 29 occasions, estimates of the actual numbers are difficult to evaluate, as some of these mines are located in or near residential areas. Women were involved in mining or activities further downstream at 23 of these mines, but only at two mines directly in extraction (Fig. 24). The most common activity is processing, especially washing of ores, followed by the sale of small goods and restauration. Women were involved in trade of raw minerals or as sponsors of individual pits at three mines. The extent to which and how many women have to engage in prostitution is not assessable due to the reluctance of the miners to respond honestly on this matter.



Figure 24 Women in Congolese artisanal mining for copper and cobalt. The women most commonly carry out rudimentary processing activities or carry out hand picking on the surface.

At eight of these 29 mines, women have organized themselves into committees or are members of the mining cooperative, this is mainly the case when women have engaged in mining or downstream activities. A total of seven mining cooperatives have been identified which, according to the statements in the field, allow and have women as members. However, for two of these cooperatives their statements were found to be inconsistent, as on their other mines, this claim was not made (i.e. 5 out of 25 active cooperatives).

7.2 Health and safety

Artisanal mining in the Congolese Copperbelt takes place both in surface mining and underground in tunnels and shafts. In addition, both natural deposits in the bedrock and artificial deposits from former industrial mining waste or tailings dumps are mined.

Above ground the primary risk for miners is caused by unsecured, unprofessionally terraced pit slopes which often slip or collapse and thus become a danger for miners working on them. Unsecured, overhanging boulders and rock walls in unstable rock formations also pose a risk to miners working below. In addition to the risk of tunnel collapse underground, there is an increased risk of falling in vertical shafts with unsafe steps. Improperly secured tunnel openings can block the only possible way back for miners in the event of a collapse, especially since ventilation shafts almost never exist and tunnel systems are not necessarily linked. In general, the danger of suffocation for miners due to inadequate ventilation often increases as individual tunnels and shafts penetrate deeper.

Accidents caused by infiltrating groundwater or rainwater flowing in from the surface pose immediate risks for miners, especially as pumps for lowering the groundwater level and for mine drainage are not always available. The instability of the insufficiently compacted and solidified material means that mining in old dumps, often via tunnels, involves even greater risks of tunnel collapse than in natural deposits. Safeguarding measures such as mine support using tunnel pillars and wooden support poles are rarely encountered, nor are anchors and/or rock bolts used to support the bedrock (Fig. 25).

Accidents

When stating the accident figures, the field teams refer to collected data from on-site interviews. A total of 63 fatal accidents and 101 accidents resulting in injuries were reported for last year. Table 8 shows the most frequent types of accidents and the number of victims. According to the interviewees, no accidents have occurred on 28 mines in the last 12 months.



Figure 25 The photographs illustrate the inadequate equipment and protection of the miners in the artisanal mining sector. Work on too steep slopes is common practice (top left), lifting heavy loads is carried out by only one man or child (top right). Wearing personal protective equipment is the exception (bottom left), tunnel openings or shafts are not secured (bottom right).

Table 8 Summary table of the types of accidents most frequently reported and the number of accidents occurring in the last 12 months. An accident represents one person.

Cause of accident	Number of fatal accidents	Number of accidents resulting in injuries
Landslide / collapsing rock stability	50	59
Fall	1	9
Unspecified	12	33

Safety equipment

Only on two mines personal protective equipment was worn by all miners. In both cases, mining companies that are or were in partnership with the mining cooperatives have provided the equipment.

On the remaining 56 mines, either not all or no one wore protective equipment. The reasons for this are shown in Fig. 26 according to the frequency of the information.

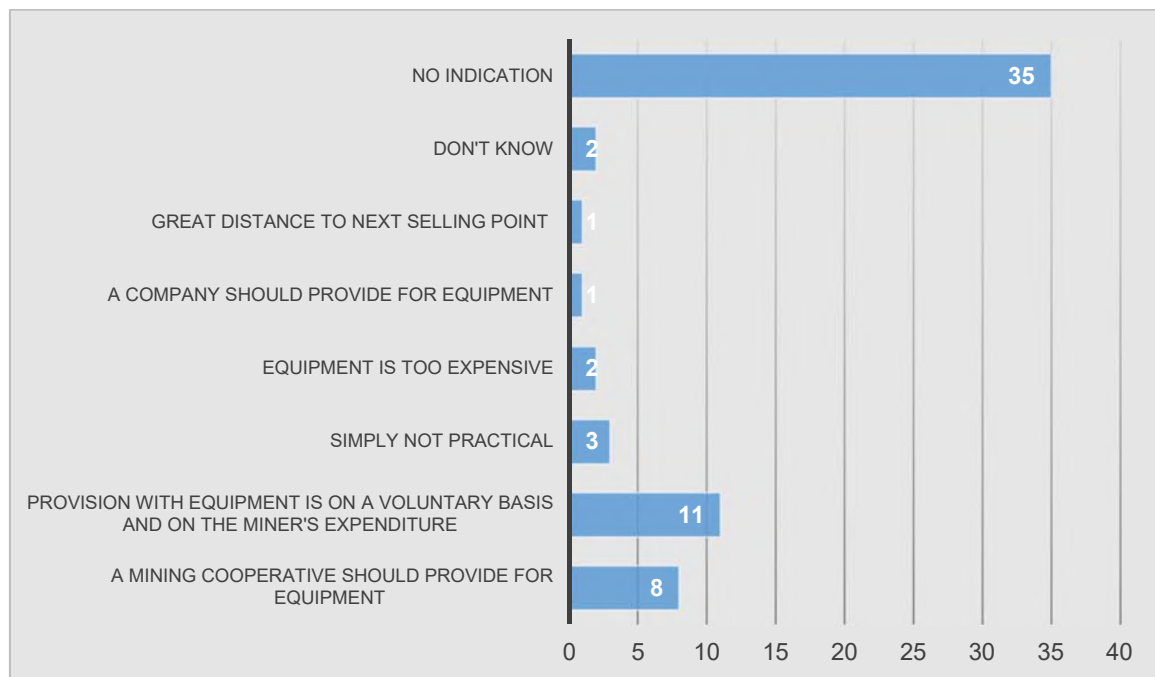


Figure 26 Histogram showing the reasons given by the interviewed miners for the absence of protective equipment.

With regard to the question of whether and who at the mine sites sensitizes miners to occupational health and safety concerns and hygiene at the workplace, on 28 mines statements were made that this was not being done. With regard to the term "sensitization", this refers primarily to the teaching of basic rules to ensure safety on mines and the need to wear protective equipment.

At the 30 remaining mines, either cooperative representatives (11), SAEMAPE officials (9) or NGO staff (2) carry out awareness-raising or training activities. In addition, both SAEMAPE and the cooperatives raise awareness on five mines, and on one mine together with representatives of civil society. At two other mines the implementation of awareness-raising measures was confirmed, but the person responsible could not be named.

In six mines, miners and cooperative representatives identified a total of five different international NGOs (1) or national civil society associations and organisations (4) that were either committed to upholding and raising awareness of human rights or to supporting formalisation efforts. On two other mines it was stated that NGOs came sporadically by or passed by, but neither the name nor the mission of the organisations could be given. No representatives of international NGOs or Congolese civil society were involved in the 50 remaining mines.

The working conditions of most miners were found to be unacceptable. Apart from the fact that they are in informal employment, the majority of the miners surveyed (40%) earn less than the national minimum wage of about \$5 per day. If one takes into account the almost universal complaints registered by the field teams regard unfair pricing practices and generally low purchase prices on the part of the intermediaries and depots, as well as the sometimes high tax demands of cooperatives and tax extortion on road barriers, it is easy to identify the causes of such grievances. The fact that this poorly paid work usually takes more than eight hours a day without adequate safety precautions and protective equipment underscores this assessment. However, it must be taken into account that with regard to the average income, a non-representative number of miners was surveyed and that the above statement does not represent a statistically founded fact, especially as it is not certain whether the few figures registered were correctly given by the artisanal miners. A plausibility check of the income by calculating the production quantity, average metal content and the indicated price at the depot, split among the number of estimated miners, resulted in incomes which were mostly below the average income registered on the respective mine. Any levies paid to cooperatives or representatives of the authorities were also taken into account.

7.3. Supply chain due diligence risks according to the OECD Guidance

Child labour

The field teams were able to detect the presence of children in a total of 17 mines (29%). Of these, four mines were in residential areas, four in the immediate vicinity, so that a demarcation between mine and living space was not obvious. In 11 of these mines, children carried out work related to artisanal mining, mainly handpicking, washing and sorting ore, but partly also work underground. In eight of these mines, children accompanied their parents working there, played there or simply stayed at their homes next to the pits (Fig. 27). At one mine, children engaged in the sale of food and small goods.



Figure 27 Women next to a washing place for copper-cobalt ores in the DR Congo. Due to a lack of alternatives to care or accommodation, small children are taken directly to the mine or washing place.

How many children were present on mines or working there was difficult to see for the field teams, especially in the residential areas of Kolwezi and Likasi and in the immediate vicinity of these towns or villages. Estimates of the field teams amount to approx. 2,500 children. Approximately 1,600 were under 10 years old, about 900 between 10 and 15 years. On two of the mines, the presence and work of children could be determined, but due to external circumstances, their numbers could not be estimated.

In this report, the number of working children has not been distinguished from the total number of children present at mines. Nevertheless, the figure is far below the figure of around 40,000 cited by UNICEF (Musao 2009) and many media reports, but is roughly coherent with the

figures in the study conducted by Faber et al. in 2017, which estimated the presence and work of around 4,700 children in the sector.

Comparing with the ILO's definitions¹⁵ of the worst forms of child labour, child labour related to mining can be assessed as work that is likely to harm children's health, safety and morale. However, it is often discussed whether the simple presence of children on mines and lighter work above ground can be considered harmful or not. With regard to children working in tunnels and shafts, however, there is no room for interpretation. This practice has to be considered as the worst form of child labour.

It is difficult to assess whether projects and interventions by civil society or NGOs are already having a positive impact on the numbers of children working in mining. Considering the relatively small number of mines on which miners confirmed their experience with NGO/ civil society organisations or simply their presence, the involvement of NGO/civil society organisations in the artisanal sector, i.e. directly on the mine, seems insufficient.

No signs of forced labour were discovered by the field teams or claimed by the miners.

To what extent the presence of the national police (PNC), military (FARDC), secret services and Garde Republicaine on artisanal mines serves to maintain public order and is therefore permissible cannot be assessed in the context of this project. The mining legislation in place does not provide for the presence of these security forces on the mines. The fact that many miners have complained about the levying of taxes on barriers and harassment by individual representatives allows the statement that their presence can have negative effects on the respect of human rights, Congolese law and, finally, on the assessment of mines with regard to the OECD Annex 2 risks.

Referring to the risks listed in Annex 2 of the OECD Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High Risk Areas, the results presented can be assigned to the following risks:

Immediate disengagement from business relationships:

- Risk of human rights violations
- Most severe forms of child labour

Commitment to risk management is required:

- Illegal Taxation at Barriers
- Legally compliant, transparent tax and duty payments
- Unclear origin of ores and thus mining conditions
- Presence of public security forces

Figure 28 visualises the assessment of various risk factors with regard to their existence in Congolese artisanal copper and cobalt mining and their recommended prioritisation in formalisation and improvement or mitigation efforts. In addition to ensuring respect for the most basic human rights, the focus should be on establishing a legal, transparent sector that

¹⁵ <https://www.ilo.org/ipec/Campaignandadvocacy/Youthinaction/C182-Youth-orientated/worstforms/lang--en/index.htm>

provides secure and decent income opportunities for a part of the Congolese population in the short and medium term, at least until sustainable alternatives are created.

tax payments	direct or indirect support of armed groups	any form of forced labour	worst forms of child labour
decent working conditions	corruption & fraud	gross human rights violations and abuses	torture, cruel, inhuman and degrading treatment
OHS	legal status of the mine site	illegal control of mine sites by public or private security forces	war crimes and other serious violations of international humanitarian law
environmental impact	social impact on surrounding communities & CSR	non-formalised commodity trade & traceability	money laundering

Figure 28 Thematic risk matrix of Congolese artisanal and small-scale mining on copper and cobalt. The colours represent the recommended prioritisation of the formalisation and improvement measures to be taken (red = highest priority). The uncoloured tiles indicate the unnoticed presence of these grievances in the sector. References to the respective topics are either derived from the definitions in Annex 2 of the OECD's Due Diligence Guidelines, or represent general topics relating to mining for which no specific reference is provided here.

8. Recommendations

As results of the mapping project, the following recommendations apply:

- The creation of economically attractive ASM zones (ZEA) which provide cooperatives with medium- to long-term planning security and, at the same time, relieve pressure on industrial concession owners and their projects. This requires sufficient knowledge and evaluation of economic and geological indicators.
- Once suitable deposits have been identified, it should be considered what capital expenditure would be required for the development of each ASM zone. By publishing the data, investors could be encouraged to invest in a trust fund for the development of ASM zones, e.g. managed by the Congolese Chamber of Mines.
- The creation of attractive ASM zones will presumably require that industrial license holders make parts of their concessions available to artisanal and small-scale mining, pursuant to Article 30 of the Code Minier. This could be achieved by creating the following incentives to support formalisation efforts. The respective provincial governments, in cooperation with civil society, could act as mediators between ASM and LSM stakeholders. This could be organised within a provincial or regional committee as it exists in South and North Kivu. These multi-stakeholder committees ("comité provincial de suivi") deal with relevant mining policy issues in their respective provinces and, in addition, in their many years of work, have also been instrumental in ensuring that mining contributes more to the local development of the municipalities and these provinces, e.g. through the establishment of the basket fund. The interprovincial dialogue platform IDAK could form the basis for the formation of such more specific, regional organisms.
- For the approval of new mining cooperatives, an examination of the organisational, technical and financial competence of the cooperative with regard to the development and operation of artisanal mines should be introduced as a standard procedure.
- It is recommended that mining cooperatives be trained in good mining practices prior commencing activities on ASM zones, with particular emphasis on occupational health and safety as well as sensitisation to respect for human rights. The rights and duties of miners and the sensitisation to environmental protection should not be neglected.
- In addition to cooperatives, the SAEMAPE and Division des Mines authorities responsible for ASM in the DR Congo should also be supported in expanding their technical capacities in order to establish better control and technical supervision in the sector.
- Mining cooperatives should be encouraged to directly buy the production mined at their mine sites from the pit chiefs and individual miners and to consistently act as commercial representatives for them when selling the ore. On the one hand, this reduces the complexity and volatility of the supply chain right from the start; on the other hand, it creates a stronger and organised negotiating party in price fixing and negotiations.

- Exporting mining companies purchasing artisanal production should declare this in their reports and, ideally, indicate mass balances of LSM and ASM production proportions for their exports.
- The impact of artisanal mining on the environment is poorly understood and quantified. The harmful impact of illegal small-scale mining on the environment, in particular the washing of ores in rivers, should be further investigated. Management measures and mitigation strategies for the identified risks should be developed. Many studies so far focus only on the impact of the industrial sector, i.e. formal mines, refineries and smelters. Reclamation and reforestation as well as backfilling of artisanal open pits and tunnels should be enforced as it is required by the Mining Code of the DR Congo.
- Certification of the artisanal copper-cobalt mines is recommended as soon as the legal framework for it has been created. A certification scheme for the copper-cobalt sector can make parts of the Congolese artisanal copper-cobalt mining sector more acceptable trading partners. This certification scheme should, in addition to the criteria for compliance with the OECD due diligence guidance, examine and certify the formalisation level of the mines and the existence of good mining practices. The CTC certification scheme, which has been implemented under leadership of the Ministry of Mines and with the technical and financial support of BGR in the Eastern DR Congo since 2011 could – following its on-going revision in 2019 – become a certification scheme which also applies for certification of copper and cobalt from artisanal production.
- The introduction of regular, legally and technically formalized mine site inspections of copper-cobalt ASM could support the mines on ASM zones in their formalization efforts and establish an attestation through mine site inspectors as a prerequisite for the purchase of artisanal production.

The findings of the survey show that pilot solutions at the level of individual mine sites or supply chains can result in selective improvements of the situation at a limited scale. However, a broadly effective, systemic effect that consistently and sustainably benefits the Congolese population as well as end consumers of the cobalt supply chain can only be achieved through cooperation with the regulatory authorities and ministries. A multi-stakeholder approach should also involve affected companies as well as local civil society actors.

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