



Mining Conditions and Trading Networks in Artisanal Copper-Cobalt Supply Chains in the Democratic Republic of the Congo

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Bundesanstalt für Geowissenschaften und Rohstoffe

Hannover, April 2021




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Executive Summary

As part of the German-Congolese development cooperation framework, the Federal Institute for Geosciences and Natural Resources (BGR) is supporting its local partners to improve control in the mining sector of the Democratic Republic of the Congo (DRC), especially in artisanal and small-scale mining. This involves more effective supervision at the mines and along the associated supply chains. A central instrument is the CTC certification scheme (Certified Trading Chains), which is already being used on a selective scale in the artisanal tin, tantalum, tungsten and gold (3TG) mining sector in the eastern DRC. The scheme aims for a long-term improvement of the capacity of artisanal mining cooperatives in combination with an independent audit of the mines. CTC is also applicable to artisanal and small-scale mining for copper and cobalt, but implementation of the system in the sector is still pending due to the sector's poor compliance with basic entry criteria and the pending establishment of necessary assessment mechanisms.

Cobalt supply from the DRC is of major global importance, e.g., for the automotive industry, as more than 60% of the supply of the battery metal depends on the Central African country. Although the majority of cobalt is extracted as a by- or co-product of industrial copper mining, a highly variable but significant share of the annual mine production is also obtained from artisanal mining. The intensity of artisanal mining activities responds to commodity price movements and international demand; its total contribution to national cobalt production can be as high as the cobalt output of some of the largest industrial mining projects in the country. In addition to its economic relevance, the artisanal copper-cobalt sector in the DRC faces a number of sustainability challenges. These include due diligence risks, especially child labour and the lack of supply chain transparency, which have already been widely discussed in the global media. Other relevant aspects include a lack of occupational health and safety and general deficits in the formalisation of the sector, which often operates in the illegal or at least in legal grey areas.

Together with its Congolese partners, the BGR conducted an initial survey of the artisanal mining sector for copper and cobalt in 2019. Its aim was to provide an objective and comprehensive representation of baseline data of the mines and the prevailing conditions there. Building on this methodology, a new field survey was carried out in September and October 2020 to update and expand baseline data for artisanal copper and cobalt mining in the DRC. In addition to artisanal mines, data on commercial depots that trade in copper and cobalt ores sourced from artisanal miners were incorporated for the first time. The core areas of this inspection were the provinces of Haut-Katanga and Lualaba, where a large part of the country's copper and cobalt mining takes place. Together with BGR staff, officials from the DRC's artisanal mining authority, SAEMAPE, were responsible for the implementation of the field survey.

A total of 67 copper and cobalt producing artisanal mines were registered in 2020, a significant reduction of the sector compared to 2019. However, compared to the previous year, a much larger share of legal and socio-economic data from mines (79%) was captured. Furthermore, 118 trade depots were registered; detailed data on trade relations and supply chain structure were collected for almost all of these (98%). Data evaluation shows that the artisanal mining sector has become less important in terms of size and economic relevance, especially with regards to the overall supply of cobalt from the DRC in 2020 (Figure 1). The estimated number of 31,000 artisanal miners currently working in the sector is much smaller than in 2019; note

that this estimate refers only to the mines covered in the field survey. Furthermore, the risks recorded in 2019 regarding due diligence requirements compliance in the supply chain remain in place. In addition to the informal to illegal status of most mines with regards to mining rights, deficiencies in occupational health and safety and lack of transparency in the supply chain as well as the unlawful status of actors involved in mineral extraction and trade still represent relevant risks. Positive changes were recorded in 2020 with regards to the overlapping of residential areas and mining areas; a large part of the mines that had been registered in 2019, which had then been located in residential areas, no longer existed in 2020.

Data analysed from trading depots indicates inconsistent and variable traceability practice with regards to ores originating from artisanal mining. In some cases, the operators of the trading depots buy ores without proof of origin and without checking the legitimacy of the seller and the mining conditions. Further downstream, 14 refineries and smelters exporting copper and cobalt concentrates or processed products from the DRC were identified; these are purchasing artisanal raw materials and partly blend them with their cobalt production from industrial mining. The identified trade relationships prove to be complex and non-transparent, with a total of over 160 supply chain actors and over 370 trade relationships identified at the time of the visit.

However, notwithstanding the above challenges, it should be noted that relevant changes regarding the listed risks and grievances could be imminent at the time of reporting (April 2021). National initiatives to formalise the sector aim to establish responsible mining practice and may make miners' livelihoods and working conditions more decent. At the same time, the stigmatisation of the artisanal mining sector might be reduced, enabling cobalt refiners to transparently declare artisanal supply contributions, without the associated downstream buyers facing major reputational risks.

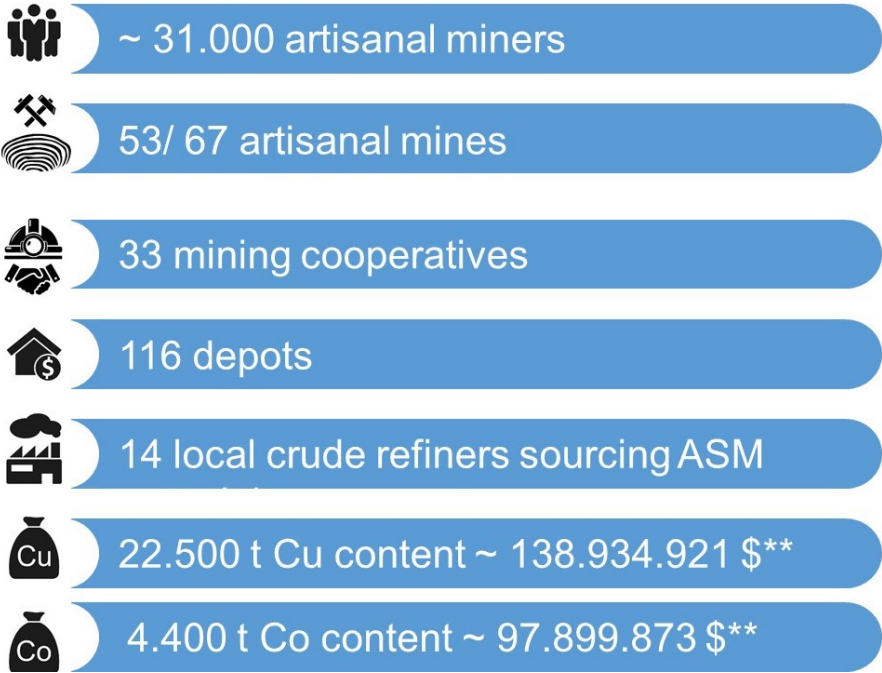


Figure 1. The most relevant data of the Congolese Copper-Cobalt-ASM sector 2020 including the calculated export values of the produced tonnages *= The number of artisanal miners and mine sites includes only the mines mentioned in the report, there are probably more mines sites and a much larger number of people employed in the artisanal mining sector. **= Based on the 2020 average prices for both metals the export values were calculated: The average price for cobalt in 2020: \$31786 per ton

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List of Abbreviations

3TG	Tin, Tantalum, Tungsten and Gold
ANR	Agence Nationale de Renseignement
ARECOMS	Autorité de Régulation et de Contrôle des Marchés de Substances Minérales Stratégiques
ASM	Artisanal and Small Scale Mining
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe (Federal Institute for Geosciences and Natural Resources)
BMZ	Federal Ministry of Economic Cooperation and Development
CAP	Cobalt Action Partnership
CCCMC	China Chamber of Commerce for Metals, Minerals and Chemicals
CDF	Congolese Franc (1 USD = 1956 CDF, OANDA Exchange Rate 15.10.2020)
CIRAF	Cobalt Industry Responsible Assessment Framework
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
DRC	Democratic Republic of the Congo
DRHK	Direction des Recettes du Haut-Katanga
DRLU	Direction des Recettes du Lualaba
EGC	Entreprise Générale du Cobalt
ETD	Entité territoriale décentralisée
FCA	Fair Cobalt Alliance
GBA	Global Battery Alliance
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	Non-Governmental Organisations
FARDC	Forces Armées de la RD Congo
OECD	Organisation for Economic Cooperation and Development
PMH	Mining Police
PNC	National Police of DR Congo
PE	Mining License (Permis d'Exploitation)
PEPM	Small Scale Mining License (Permis d'Exploitation de la Petite Mine)
PER	Mining License for Tailings (Permis d'Exploitation des Rejets Minier)
PR	Explorationslicense (Permis de Recherche)
RCCM	Régistre du Commerce et du Crédit Mobilier
RCI	Responsible Cobalt Initiative
RMI	Responsible Minerals Initiative
SAEMAPE	Service d'Assistance et d'Encadrement du Secteur Artisanale et à Petite Echelle
SMIG	Minimum wage
ZEA	Artisanal Exploitation Zone (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 authorities and pilot enterprises in artisanal and small-scale mining (ASM), is supporting the implementation of the CTC ("Certified Trading Chains") certification system in the east of the Democratic Republic of Congo (DRC). The project has been implemented since 2009 as part of the German-Congolese portfolio of technical development cooperation on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) under a joint programme of BGR and GIZ. The CTC approach is based on a combined system of support measures and independent monitoring processes and is thus considered a core instrument for improving the economic, environmental and working conditions as well as the legal status of operations in Congolese small-scale mining. It specifically strengthens the sustainability of operations and cooperatives, even beyond the minimum standard of freedom from conflict and due diligence

In 2019, BGR and partners already conducted a survey and assessment of technical data for the purpose of analysing the sustainability of small-scale mining for copper and cobalt in the DR Congo. The data and findings obtained were also used to assess the possibility of implementing the CTC system on artisanal mines in the Congolese copper belt in the near future. The analysis showed that the copper-cobalt sector in small-scale mining was associated with relevant risks in terms of due diligence and sustainability at the time of data collection. These included the increased risk of human rights violations in connection with the impermissible presence of certain actors at the mining sites, weak state structures, the informal or illegal status of the mines due to the lack of rights of use or mining rights, a lack of occupational safety, as well as child labour in some cases, but only in isolated cases the worst forms of child labour. Without the assurance of compliance with minimum requirements in terms of formalisation and due diligence, the potential for implementing the CTC approach in the sector was extremely limited.

In the context of this data collection, the focus lay on the extraction of the commodities mentioned. The downstream supply chain and its actors up to export, on the other hand, could only be considered to a limited extent within the analysis. Nevertheless, this provided a heterogeneous and complex picture of the supply chain, with a multitude of actors, non-transparent and volatile supplier-buyer relationships and, as a consequence, a plausible traceability of copper and cobalt ores from Congolese small-scale mining that is difficult to guarantee.

Against this background, this report presents the update of the analysis of the sustainability of artisanal copper-cobalt mining in Haut-Katanga and Lualaba provinces based on a renewed and more detailed study of the sector. In addition, by expanding the data collection to include trade depots, more actors in the intra-Congolese supply chain will be integrated into this analysis to achieve a better understanding of the supply chains. The measure could be realised thanks to the significant involvement of BGR's partners, primarily the artisanal and small-scale mining authority SAEMAPE and the Ministry of Mines of Lualaba Province, as well as thanks to the support and authorisation of the field work by the competent national and provincial authorities.

2. Introduction

Copper-cobalt production in the DRC continues to draw international attention with regard to cobalt supply to industry (e.g., for electric vehicles; Fraser et al. 2021) as well as in terms of due diligence risks in the cobalt supply chain (e.g., traceability, child labour). International and Congolese NGOs as well as the media reported increasingly on grievances in DRC's mining sector between 2016 and 2019 (Amnesty International 2016, SOMO 2016, Bloomberg 2018, 2019a & 2019b, Financial Times 2019, Zeit 2019).

More recent reports (e.g., Mancini et al. 2020, OECD 2019, BGR 2019) document the sector's conditions based on broader and more objective data availability and provide recommendations regarding the formalisation and compliance with due diligence in the supply chain. Consistent findings of these reports relate to concerns about poorly implemented government oversight of the sector. This results in uncontrolled migration, deficiencies in occupational health and safety, environmental deterioration, social problems and the promotion of corruption. However, unlike the eastern DRC, the region is not a conflict area.

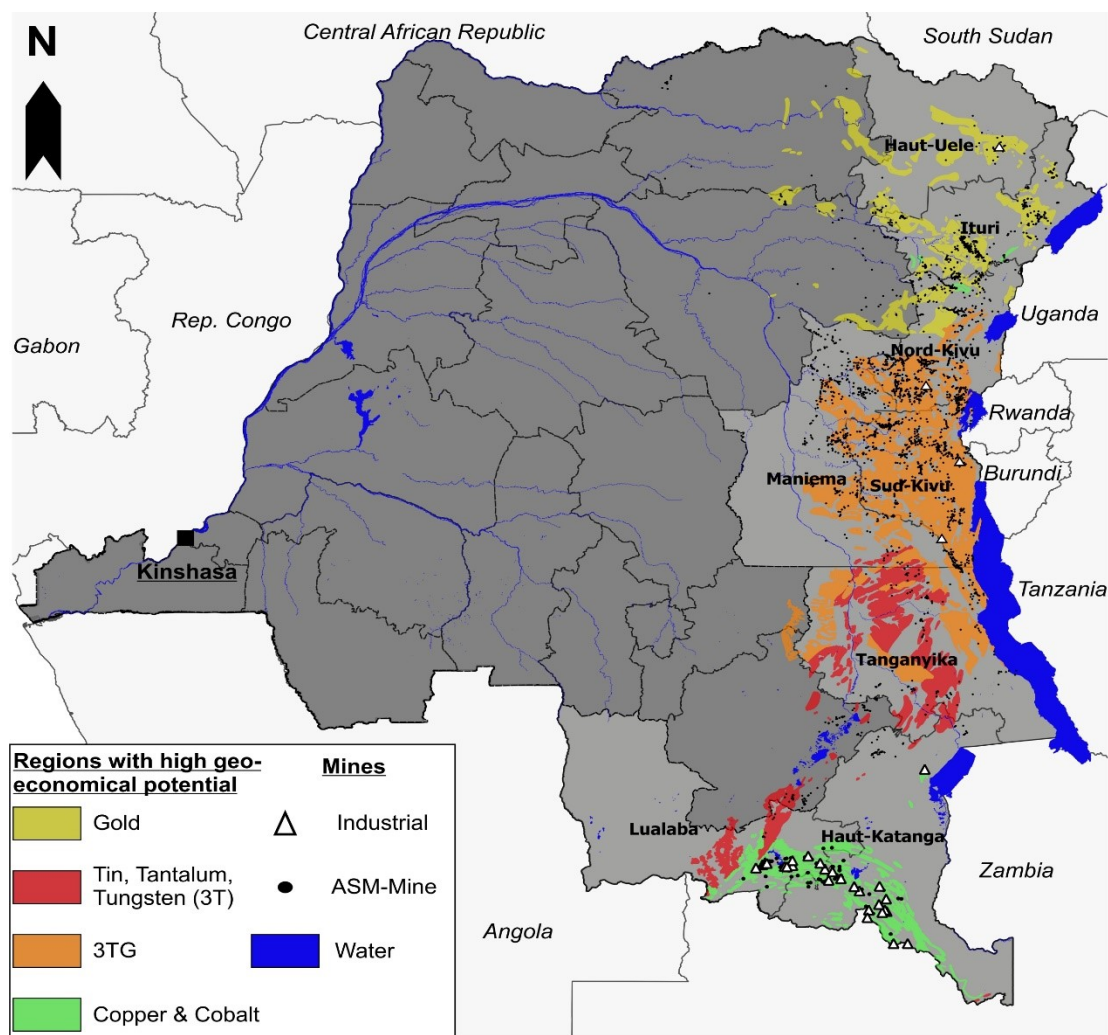


Figure 2. Map of the DR Congo and the most important mining regions. A large part of the mineral resources are concentrated in the east, but the majority of the country is considered to be vastly under-explored.

Although the majority of the DRC's mine production comes from industrial mines, BGR estimates for 2019 put the share of artisanal production in total cobalt exports at around 15%, with about 12,500 t of cobalt content (BGR 2019). Due to the lack of sustainable employment alternatives and the comparatively attractive income conditions, the sector exerts a very high

economic pull on the impoverished population. Thus, price volatility impacted noticeably the number of miners, mines and the absolute share of ASM production in the recent past. Artisanal mining in the DRC - not only for copper and cobalt but also for gold, diamonds, tin and tantalum (coltan) - is generally an important source of income for the Congolese population and in some years provides up to one million jobs, most of them informal (Figure 2).

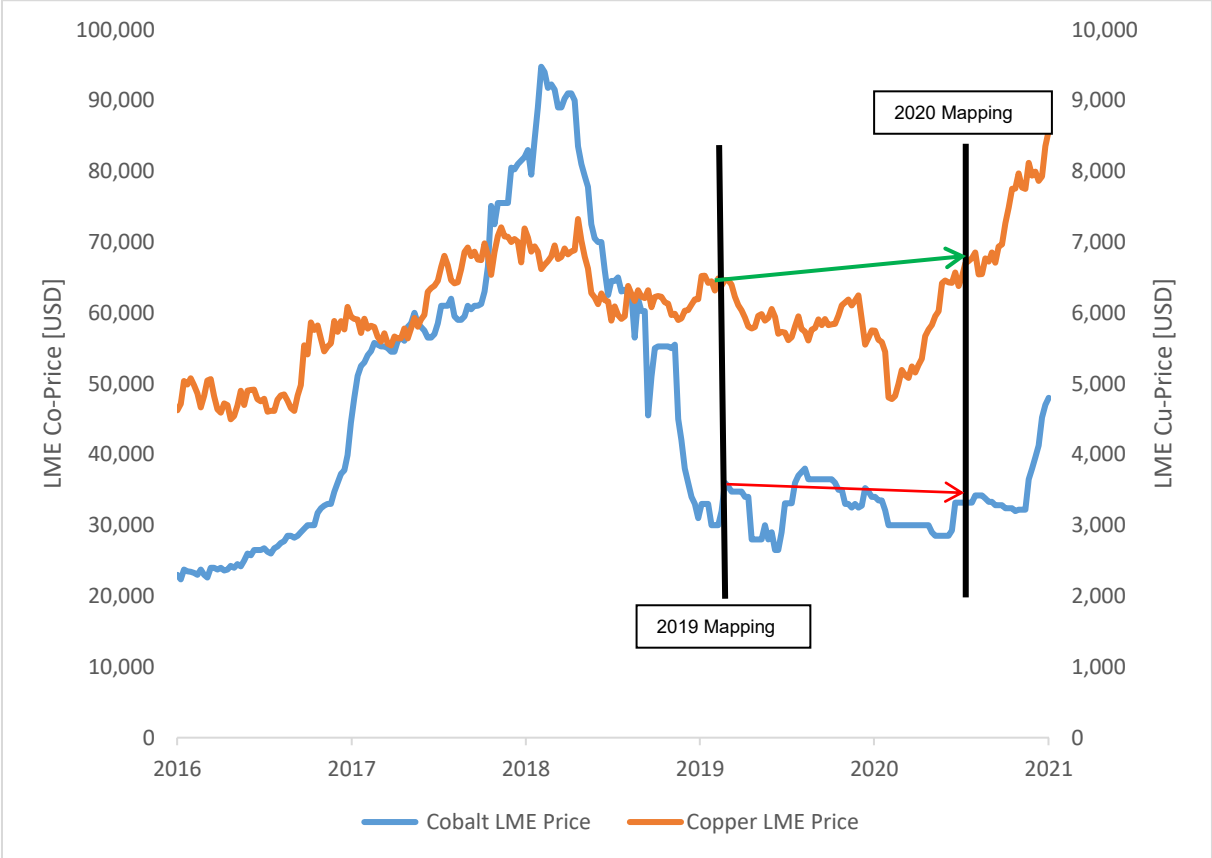


Figure 3. Price chart of the LME copper and cobalt price development over the last five years. The graph illustrates the boom and bust cycle of the cobalt market in 2017 and 2018, as well as rising commodity prices towards the end of 2020 due to much stronger Chinese economic growth and the forecasted upturn in the EV market (source S&P 2021). The price chart also shows the international commodity prices applicable to copper and cobalt at the time of the 2019 and 2020 field surveys. The arrows between the black lines show the price trend for the respective commodity between the dates, positive for copper and negative for cobalt.

The cobalt price increase recorded from 2015 through early 2018, spurred by the forecast of increased demand and expected supply deficits, was followed by an equally rapid correction to the price level of the pre-boom years. Until the beginning of 2021, the price stagnated at about this level (Figure 3). Correlations can be observed between price developments and ASM activities. Estimates of production and employment in artisanal cobalt mining were highest in 2017 and 2018; since the price drop, both have declined, indicating that the sector is highly cyclical (BGR 2019). However, other factors have also played a role in the decline of ASM activities since 2019, such as the COVID-19 pandemic (Barume et al. 2020), the gold price increase which triggered migratory movements of miners towards the sector, and the closure of several mines following the intervention by the Congolese army in mid-2019. As the copper price has been comparatively stable and positive until the recent past (Fig.3), it can also be assumed that individual artisanal miners or cooperatives have selectively extracted copper ores while cobalt ores were stockpiled by either the intermediaries or the cooperatives. Related to this, analysts also emphasised the non-negligible potential of the ASM sector in terms of meeting demand in a short-term adaptable manner (CRU 2019).

A large part of artisanal cobalt mining, as also described in this report, takes place illegally or at least informally. The individual local supply chains of the artisanal cobalt ore to the processing refineries remain hardly comprehensible for outsiders. Unlike many supply chains of the so-called 3T raw materials (tin, tantalum and tungsten), the supply chains of artisanal cobalt are not traced back on a broad scale; in many cases there is a mixture with industrially mined ores, and the share of artisanal material is not indicated as such when exported.

The importance of the DRC in terms of global copper and especially cobalt supply has already been outlined in older reports and is considered to remain relevant (Al Barazi 2018, Al Barazi et al. 2017, BGR 2019, Gilsbach 2020, Schütte 2021). In the following introductory text, only the context-relevant developments that have occurred since the last reporting (BGR 2019) will be discussed.

International

International initiatives or projects promote more transparent reporting on company supply chains through the development of frameworks (CIRAF of the Cobalt Institute, Cobalt Reporting Template of the RMI) or aim at the validation of cobalt-processing refineries (refiner assurance process, RMI, RCI & CCCMC - China Chamber of Commerce for Metals, Minerals and Chemicals). With regard to cobalt, this validation distinguishes between different refinery types. Audits are carried out both at refineries in the DRC (so-called crude refiners producing intermediate products) and internationally at refineries producing cobalt chemicals or metal. The first audits at both levels have been carried out and the first refineries in China, Belgium, Finland and the DRC have been listed as compliant (RMI 2021).

The China Chamber of Commerce and Mines (CCCMC), in partnership with international companies, has established the Responsible Cobalt Initiative (RCI), which promotes the application of the OECD Guidelines for Responsible Mineral Supply Chains, and supports the capacity development of Chinese stakeholders to comply with the due diligence requirements of the Guidelines and the Chinese Due Diligence Guidelines.

The GBA, in collaboration with RMI and RCI, engages locally in artisanal copper and cobalt mining throughout the Cobalt Action Partnership (CAP). In collaboration with the Fair Cobalt Alliance (FCA), the focus is set on the development and piloting of a standard for artisanal mining. This standard will initially be tested in the Congolese copper belt. The FCA, an alliance of extractive and processing companies as well as NGOs and consultancies, focuses on formalising the supply chain and establishing responsible artisanal mining (Figure 4).

The Global Battery Alliance (GBA), an alliance of companies, government organisations, NGOs and universities, is developing the Battery Passport as a means of proving the responsible and sustainable production of lithium-ion batteries and the raw materials required for them. Its relevant criteria are to be based on existing standards and laws.

The GBA, in collaboration with RMI and RCI, engages locally in artisanal copper and cobalt mining throughout the Cobalt Action Partnership (CAP). In collaboration with the Fair Cobalt Alliance (FCA), the focus is set on the development and piloting of a standard for artisanal mining. This standard will initially be tested in the Congolese copper belt. The FCA, an alliance of extractive and processing companies as well as NGOs and consultancies, focuses on formalising the supply chain and establishing responsible artisanal mining (Figure 4).

The London Metal Exchange (LME) has also published a responsible sourcing framework in 2019 for producers of the brands traded there, including certain cobalt brands. This framework is based largely on the five steps of the OECD due diligence framework and coherent standards that are audited internally or externally.

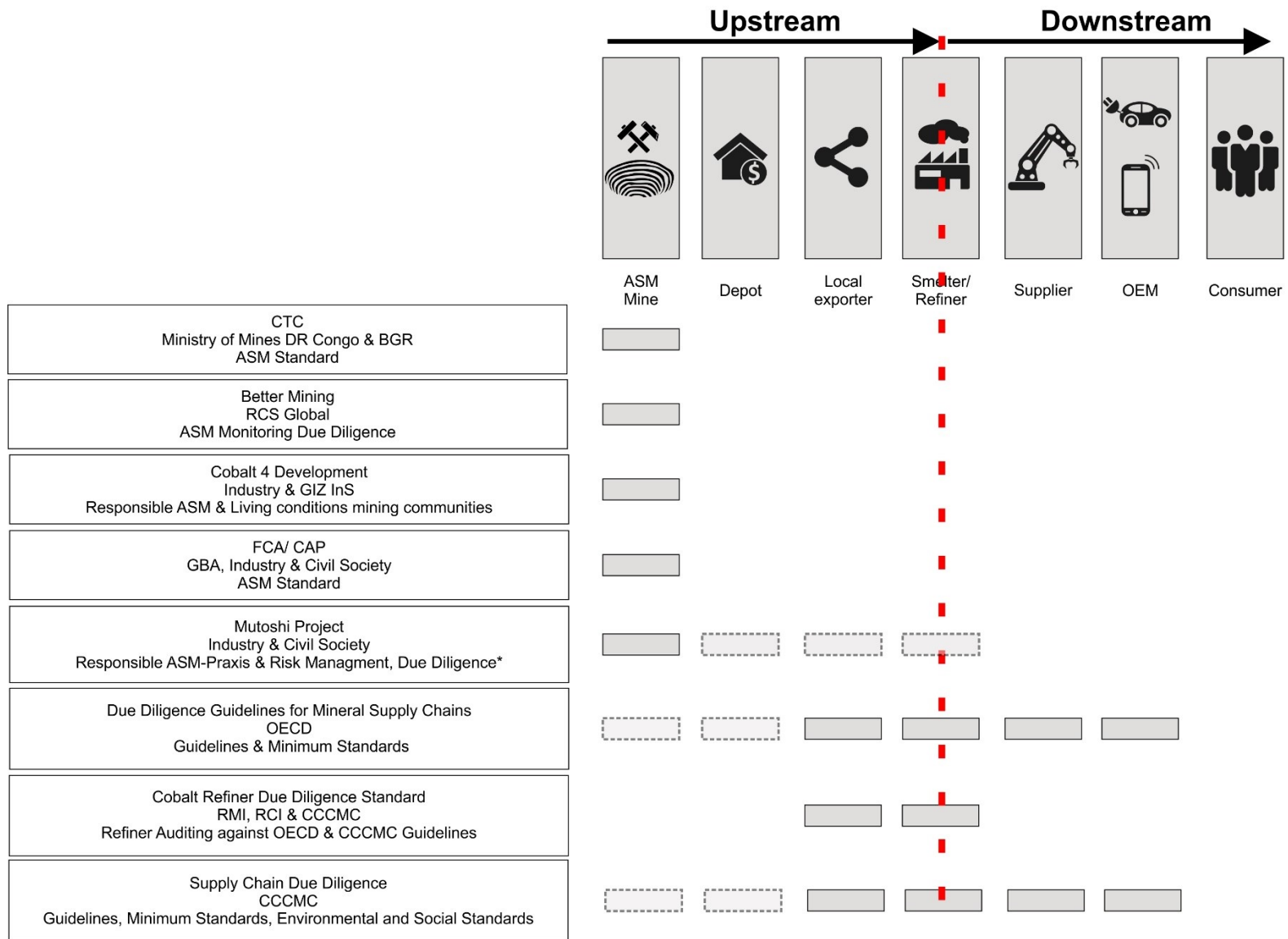


Figure 4. Schematic representation of certification systems, guidelines, initiatives and programmes that apply to the cobalt supply chain with reference to ASM in the DR Congo. In addition to the name, the diagram also shows the responsible organisation(s) and summarised objective. *= This also includes improved internal traceability

An overview of the international initiatives, their composition and objectives can be found in Table 1. Communications by car manufacturers (BMW 2021, Daimler 2021, Volkswagen 2021) are becoming increasingly relevant for industrial mining. They address the integration of mines certified according to certain standards (e.g., IRMA, CERA) in their supply chains as an important part of the company's future sourcing policy.

Table 1. Overview of initiatives, frameworks, standards and projects that primarily play a role in the context of cobalt mining in the DR Congo, whether in the country or at the international level.

Initiative	Organiser	Objectives in the ASM sector
Responsible Cobalt Initiative (RCI) Founded: 2016	CCCCMC	Set and audit supply chain standards. Due diligence training for its members is being implemented, translation and communication of the CTC manual embedded in DRC law and the functioning of the system for members operating in DRC is underway.
Global Battery Alliance (GBA) Started: 2017	PPP- Platform initiated by the World Economic Forum	Strategic plan developed for 3 years. In the first year (2020), focus on two initiatives: (1) Battery Passport in development (quality seal for sustainability of LIBs), prototype 2021, ready for launch end 2022. (2) Cobalt Action Partnership: Development of an ASM standard for cobalt (see separate line). In addition, programmes for low-carbon and circular economy are being pursued.
Cobalt Due Diligence Started: 2017	Responsible Minerals Initiative, RMI	The initiative plans to support a pilot artisanal mine and surrounding communities in improving working and living conditions over a 3-year period. An extension is under discussion, but the core elements of an extended project are not known at the time of reporting.
Cobalt for Development Started: 2019	Industry Initiative Implemented by: GIZ International Services	The initiative is planning over a 3-year period to support an artisanal pilot mine and surrounding communities at the improvement of working and living conditions. An extension is in discussion, which core elements an extended project will contain is at this moment not known.
Fair Cobalt Alliance (FCA) Started: 2020	Industry and Civil society	In the context of the development of an ASM cobalt standard (see CAP), FCA is to develop this standard and examined cross-references to CTC DRC (benchmarking).
Cobalt Action Partnership Started: 2020 (within the GBA)	GBA	Core GBA activity for 2020/2021. Development of an ASM cobalt standard (which would be a de facto Congolese standard, as ASM cobalt is almost non-existent elsewhere). In addition: stakeholder engagement, addressing root causes of child labour DRC.
Better Mining Started: 2019	RCS Global	Local monitoring with the aim of responsible ASM cobalt according to OECD. Implemented in DRC on 3 ASM cobalt mines in 2019, expanded to 6 sites since 2020. 12 sites to be integrated by 2022.

Developments in the DR Congo

An intervention by the Congolese army in mid-2019 led to changes within the sector and the supply chain. A large part of the local cobalt trading depots, which supplied themselves with raw materials produced by hand-pickers and artisanal mining and which then sold them on to local refiners or exporters, were destroyed; illegal and intolerable mines in certain mining concessions were shut down (Amnesty International 2019, Reuters 2019). The main reasons for the eviction were previous accidents in illegal mines, as well as threats to industrial projects by artisanal miners related to such accidents, access denial to the concession, or price disputes with buyers.

The classification of cobalt as a strategic raw material, which is subject to special regulations and taxation (Ministry of Mines 2019a), resulted in the establishment of the new regulatory authority ARECOMS at a national level (Ministry of Mines 2019b). This authority is to be entrusted with the regulation and subsequent certification of cobalt production from Congolese artisanal mining. However, at the time of reporting, it was not clear according to which standards ARECOMS will be certifying mine sites.

Furthermore, the state-owned company *Entreprise Generale du Cobalt* (EGC) was founded in 2020. According to a decree of the Congolese government, it is to be the sole buyer of artisanal cobalt production and thus assume a monopoly position. The intended approach of the Ministry of Mines and the EGC is based on a classification and control of artisanal mines by the ARECOMS authority, which then approves formalised trade between the mine and EGC.

An off-take agreement between EGC and *Trafigura* has been made public. Ensuring compliance with due diligence and minimum standards at EGC mines is to be done jointly with the organisation *PACT* (*Trafigura* 2020a). This constellation follows the approach of the *Mutoshi* pilot project. Closed since December 2020, the project was based on a similar partnership between a mining company (*Chemaf*), mining cooperative, trader and non-governmental organisation (*Trafigura* 2020a). At the end of March 2021 the responsible sourcing standards to be enforced under the EGC-*Trafigura* partnership were published and are to be applied by partner cooperatives, EGC buying centres and ASM material processing refineries (*Trafigura* 2021). These standards aim to establish responsible supply chains up to the point of export and good mining practices at the supplying ASM mines. International frameworks such as ARM's *CRAFT* standard and RMI's *Risk Readiness Assessment* (RRA) were cited as references for this standard, while at the national level, EGC standards were aligned with the CTC certification system.

Notwithstanding the above, the government of *Lualaba* province has opened the *Musompo* trading centre, which aims to better channel and regulate trade of artisanal production and thus make it more traceable. In contrast, efforts to create new provincial ASM zones (ZEAs) have not made significant progress since the previous BGR reporting period (October 2019). The geographical overlap of industrial mining and artisanal mines, hand-picking and illegal mining of ores on industrial concessions continue to result in disputes and protests. The presence of the army, which continues to guard industrial projects that are under particular pressure from illegal artisanal miners, contributes to the fact that these conflicts are not always resolved peacefully (*Radio Okapi* 2021a *Radio Okapi* 2021b).

3. Methodology

Preparation and implementation

In the course of the study in Haut-Katanga and Lualaba provinces, artisanal mines and commercial depots were surveyed over a wide area and representative data on their operation and environment were collected. In addition to economic indicators, legal, administrative and social aspects were also surveyed to determine the factual condition of mining sites, depots and their surroundings. Finally, these data were compiled in a table and graphically presented in a geo-information system.

Once the necessary permission had been granted by the DR Congo's National Ministry of Mines and all the authorities involved had been informed, the field study was carried out in Haut-Katanga province in September 2020. For this purpose, two field teams were deployed, composed of BGR employees and officials from the Congolese artisanal and small-scale mining authority SAEMAPE. Depending on the supply chain level, BGR staff were accompanied either by SAEMAPE experts for artisanal mining or for the depots. The objective and methodology of this field work were communicated in advance during a one-day training session by BGR. A total of 13 days were needed for the mapping in Haut-Katanga Province.

After a one-week interruption, the field study was continued in October 2020 in Lualaba province, also with two field teams. The same BGR team members were deployed as for the field work in Haut-Katanga. They were accompanied by representatives of SAEMAPE and the Ministry of Mines of Lualaba Province. The field work in this province lasted 23 days.

The main object of the investigations was to record artisanal mines and trade depots as comprehensively as possible and to analyse common mining and trade practices in the sector. In the process:

- Mining cooperatives or their local representatives
- artisanal miners
- Intermediaries
- On-site managers of the trading depots

were interviewed and their mining and trading activities observed.

The detailed description of the methodology can be found in the previous BGR report on the same topic (BGR 2019). With regard to the factors surveyed and the target groups, however, the data collection is more detailed and broader in order to be able to make a more detailed statement about the intra-Congolese supply chains.

Data quality

It was rarely possible to consult documents on site, either because they were not available or because nobody wanted to show them. A lack of willingness to cooperate, ignorance or mistrust also meant that not all questions could be answered or the mine could not be entered at all. The drop-out rate of 21% was much lower in comparison to 2019 (45%), but at the same time it must be taken into account that the total number of mines has also been greatly reduced and especially the mines that were inaccessible in 2019 no longer seem to exist (2019: 102 mines; 2020: 67 mines, 118 depots).

Limitations identified during the study relate to the quality/reliability of some data. Regarding the representativeness of the data, it cannot be assessed with certainty as the inclusion of the entire sector in the mapping study is not guaranteed. It can be assumed that further mines and depots exist. Due to the varying sources of the data obtained, various aspects are to be

assessed differently with regard to their reliability and consistency. The reasons for this are, in particular, statements made during interviews that are influenced by motivations. Furthermore, simple ignorance or lack of understanding plays a role. Identified motivations are protection of interests (because of illegal activity), cover-up and fear (feared reprisals by buyers). For example, the question about a cooperation agreement (MoU) between the cooperative and the concession owner was often answered with "yes", but not substantiated. In contrast, photographs, GPS data and observations by BGR staff are assessed as reliable (e.g., production, legal framework conditions, safety equipment).

Field visits orchestrated or restricted by cooperative or depot representatives or security officials are assessed by the field teams as non-systematic, but nevertheless restrictive at points. In particular, the data collection at the depots in Haut-Katanga Province should not be classified as unfiltered, as the visits by the teams were preceded by letters and check visits by various authorities. Finally, it must be borne in mind that the data produced represent snapshots of the respective mines and there is a likelihood that circumstances at some mines may have changed between the time of the visit and the time of reporting.

Nevertheless, it can be assumed that the results presented in the follow-up reflect a statistically relevant share of artisanal copper and cobalt mining in the DR Congo and the prevailing conditions in the sector at the time of the field visit. At the same time, however, no claim can be made for complete coverage of the sector (see subsequent chapter).

Data analysis

Following the field survey, the collected data was examined for contradictions and inconsistencies and, if necessary, cleaned up for further analysis or harmonised between the field team.

Furthermore, depending on the subject, the data was compared with the collected data from the 2019 survey in order to identify possible developments and trends. Collected data was verified or supplemented as far as possible using various sources of information, including:

- Mining Cadastre of the CaMi Authority
- Mining law of the DR Congo
- Commercial Registry RCCM (online)
- Registry of mining operators published by the authority CTCPM
- Production statistics of the Congolese Ministry of Mines
- Statistics of the Bank BCC on exports of the DR Congo

In addition, the geo-located data of the mines and depots were plotted in a geo-information system.

4. Data

A total of 67 copper and cobalt producing mines were identified in the project area (Figure 5). This constitutes a decrease of 35 mines compared to 2019, i.e. by almost one third. However, it is positive that the number of inaccessible mines was relatively low (Table 2). Thus, proportionately more mines of the current inventory could be included in the analysis. This implies that the sector is better represented in the present report compared to the previous report (BGR 2019). Nevertheless, the present report does not claim to cover the complete artisanal cobalt sector.

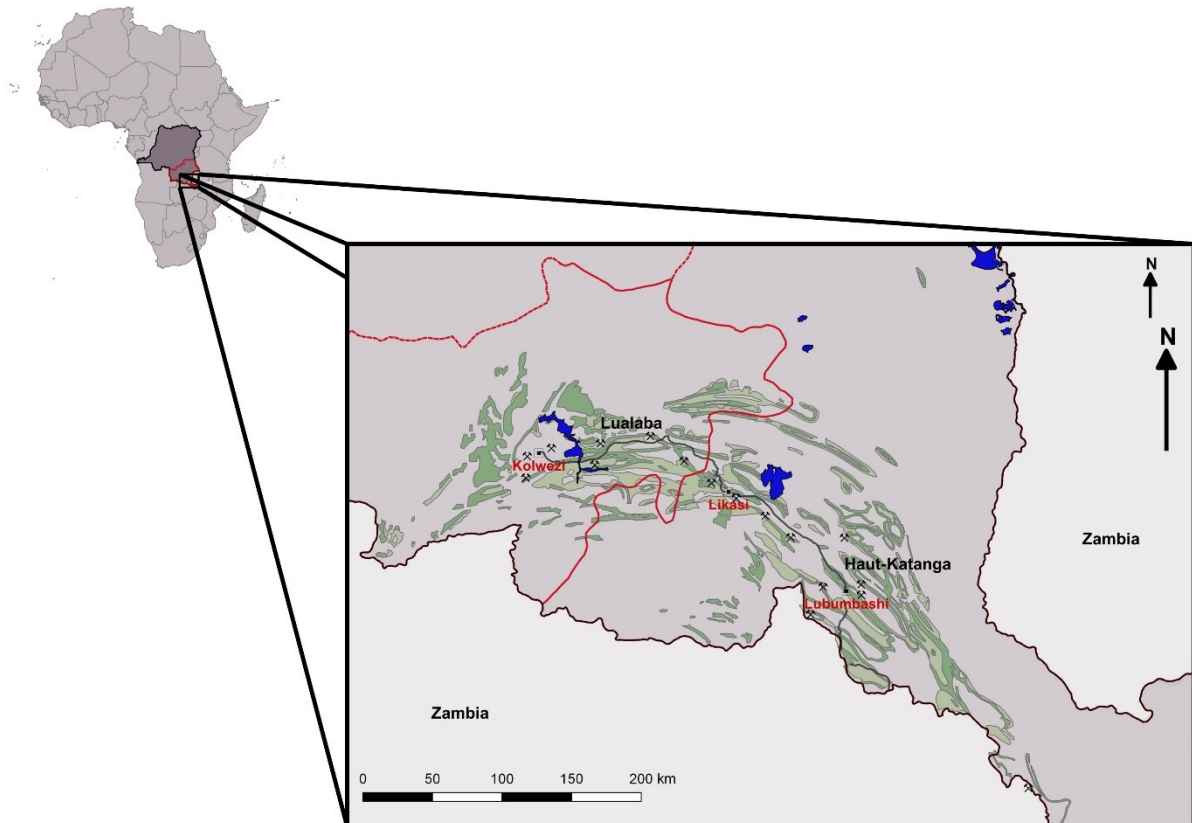


Figure 5. The map shows the Congolese part of the Central African Copper Belt, in which the two large cities of Kolwezi and Lubumbashi are located. The green areas mark the geologically relevant regions for copper and cobalt mining.

A total of 27 mines identified in 2019 were no longer included in the inventory, as mining activities there stopped. In contrast, 25 new mines were added; 28 mines from the 2019 database continue to produce cobalt (only mines that can be considered are counted). At five mine sites, access was denied while nine others were temporarily inactive. Both inactive and inaccessible mines were not included in the present analysis. Therefore, in total, 53 mines, 34 in Lualaba and 19 in Haut-Katanga, are considered in the following analysis. Notwithstanding this selection, all 67 identified mines were evaluated in terms of their geographical location with regards to superposition with industrial mining concessions.

A total of 118 trading depots were identified during the fieldwork. Out of these, 39 active depots were concentrated in one trading centre in Musompo, near Kolwezi, although this is not the official trading centre established by the provincial government. Only two depots denied access. Many depots are located either in the towns of Kolwezi, Likasi, Lubumbashi, in close proximity to the mines that supply them, or near industrial mining concessions where miners pick up ores. Table 2 summarises the data coverage of mines and depots for this report. Figure 6 illustrates the locations of the mines and depots in Haut-Katanga and Lualaba provinces.

Table 2. Number of mines and commercial depots recorded in the 2019 and 2020 site visits (2020). In addition to the absolute number, a comparison is also made between the mines and depots entirely included in the subsequent analysis and those that considered only partially or not at all due to inaccessibility or insufficient information.

Evaluation status	Number of ASM mines 2019	Number of ASM Mines 2020	Trade depots 2020	Data coverage in 2019		Data coverage in 2020 [ASM sites / depots]	
Details not known	23	-	-	None		None	
Access denied/ data capture denied	13	5	2	Partially included, recording of geographic position, no further data collected			
No active production	8	9	-	Partially included, recording of geographic position, no further data collected			
Active copper-cobalt ASM-mine sites / depots	58	53	116	Completely included, geographic position and detailed data collected	-	Completely included, geographic position and detailed data collected	
Total number of existing copper-cobalt-mine sites / depots	102	67	118	56 % of total data collected	77 % of total data collected	79 % / 98 % of total data collected	100 % of total data collected

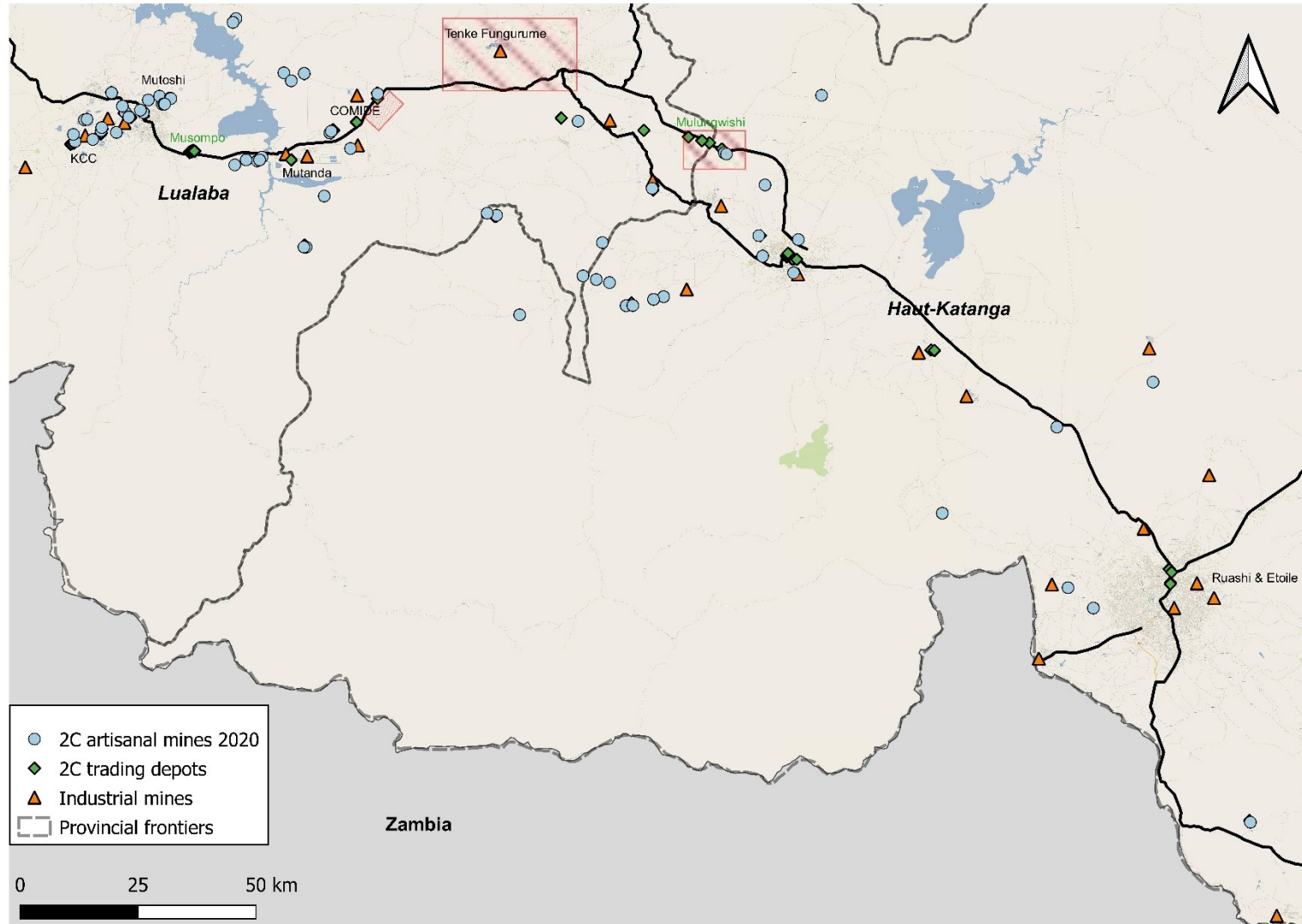


Figure 6. Distribution of artisanal mines and trading centres in the Congolese Copperbelt. In addition to the most important industrial mining projects, the artisanal mines active in 2019 and 2020 are shown. Due to spatial proximity, the depots in trading centres such as Musombo cannot be shown individually and are therefore combined into one symbol. The red rectangles indicate regions where the army has closed depots and ASM mines in mid-2019.

5. Changes in Formalisation Prospects Compared to 2019

Overall, about 87% of the artisanal mines assessed are located on mining concessions (PE) of industrial companies. A further five artisanal mines are located in production concessions that overlap with licences for the exploitation of tailings (PER). One mine is located on an exploration licence (PR); only three mines are located on two ASM zones (ZEA) explicitly designated for artisanal mining. It should be noted that two of these mines are in close proximity to each other and are located in the same ASM zone (Table 3). 33 of these mines are located on concessions of the state-owned mining company Gecamines, and three mines are also located in the middle of residential areas.

Table 3. Reconciliation between active, inactive and inaccessible artisanal mines and the status of the areas on which these mines are located, as filed with the mining cadastre.

Permit type	Artisanal mine sites active in 2020	Artisanal mine sites inactive or non-accessible in 2020
PE	44	14
PE/PER	5	-
PR	1	-
ZEA	3	-

Table 3 shows that the majority of artisanal mining continues to take place on concessions dedicated to industrial mining. These concessions have been applied for by companies, most of whom have no involvement whatsoever in artisanal mining and are engaged in either industrial mining or exploration and pay corresponding license fees for this purpose only.

ASM zones, including those newly designated since 2019, remain unused. The majority of these ASM zones are located in remote, poorly developed areas away from the major National Road 1 (Figure 7). Transporting ores and concentrates as well as consumables, whether from mine to depots or from depots to refineries, would often be too difficult and too costly compared to mining in more developed and accessible areas, such as industrial concessions. Furthermore, for a large part of the currently existing ASM zones, away from well-developed infrastructure and historic mining regions, only little exploration data is available and therefore it is not clear whether viable deposits can be developed. The development of an artisanal mine in such a remote under-explored ASM zone is thus comparatively unattractive. Figure 7 shows that most mines are located near the road or clustered in centres. The only exception is part of the Kambove territory southwest of Likasi. It is striking that no artisanal mine is located in an area that is not classified as either a concession or ASM zone in the mining cadastre. The majority of the mines are located within industrial production concessions, so-called PE.

According to the national Ministry of Mines, as of February 2021, none of the artisanal mines operates under a contract between the mining cooperatives and the concession owner. In most cases, the presence of artisanal miners is tolerated by license holders in order to prevent conflicts and to prevent them from jeopardising their own industrial projects. At the time of the fieldwork, however, a MOU between a cooperative and a mining company still existed for three mines, but the purchase of production had already been stopped; economic reasons were given here.

None of the concession owners of those concessions where the artisanal mines are located were identified as buyers of artisanal production, neither on the mines located in their own concessions nor outside. This leads to the conclusion that industrial concessionaires continue

to bear the risks that artisanal mining may entail in terms of safety and environmental impact, without benefiting from the commercialisation of the ores extracted within their licences. In most cases, the existence of artisanal mines is tolerated and there is no push to close them down, so as not to create discord and possible risks to their own mining operations. Subcontracted security companies of some industrial concessionaires are limited to confiscating the cobalt ores extracted from their areas, which are then dumped and thus not fed into the company's own supply chain.

Any disputes between buyers and artisanal miners, as well as grievances, legitimate or not, are often managed by the licence holders, despite them not being involved in artisanal mining, in order to avoid further problems.

The informal nature of the artisanal sector prevents direct involvement in these mines, especially by international organisations and donors, as this could be regarded as promoting illegality and concessionaires would not always approve of this step towards recognising artisanal mining on their licences. At the same time, the illegality results in planning uncertainty, which prevents investments and the development of the mine.

It remains to be seen to what extent and how quickly the initiative of the state-owned company EGC can establish legal ASM mines. This would presumably require the consent of at least one industrial concessionaire or the state-owned company Gecamines, as only on these licences currently developed and lucrative ASM mines could guarantee already concluded purchase agreements with commodity traders.

Legality of the artisanal and small-scale sector

Compared to 2019, the situation has not evolved. The majority of artisanal mining continues to take place illegally or in a grey zone of tolerance, which, however, offers no security and makes cooperation or a more in-depth engagement difficult or impossible for companies. Furthermore, international companies, mining concessionaires or buyers, avoid direct cooperation with the artisanal mining sector or pursue a rigorous policy of distancing themselves from ASM. Concerns about responsibilities (e.g., in case of accidents), reputational risks or pressure from commercial partners are too great.

There is also reluctance to cede, in the framework of Article 30 of the Congolese Mining Law (2018), parts of the concession which would then result in the ceded surface's conversion into an ASM zone, once an MOU has been signed. If these companies do not have the possibility or the will to buy, process and eventually export artisanal cobalt production, possibly due to requirements on the part of the clients downstream in the supply chain, there is no economic incentive to agree to the cession of parts of their concessions for an artisanal project. As companies have paid license fees over the years for these concessions, they would not gain any benefits from this. As already observed in 2019, exporters, on the other hand, knowingly purchase ores from third-party concessions that were de jure illegally produced (see chapter on supply chains).

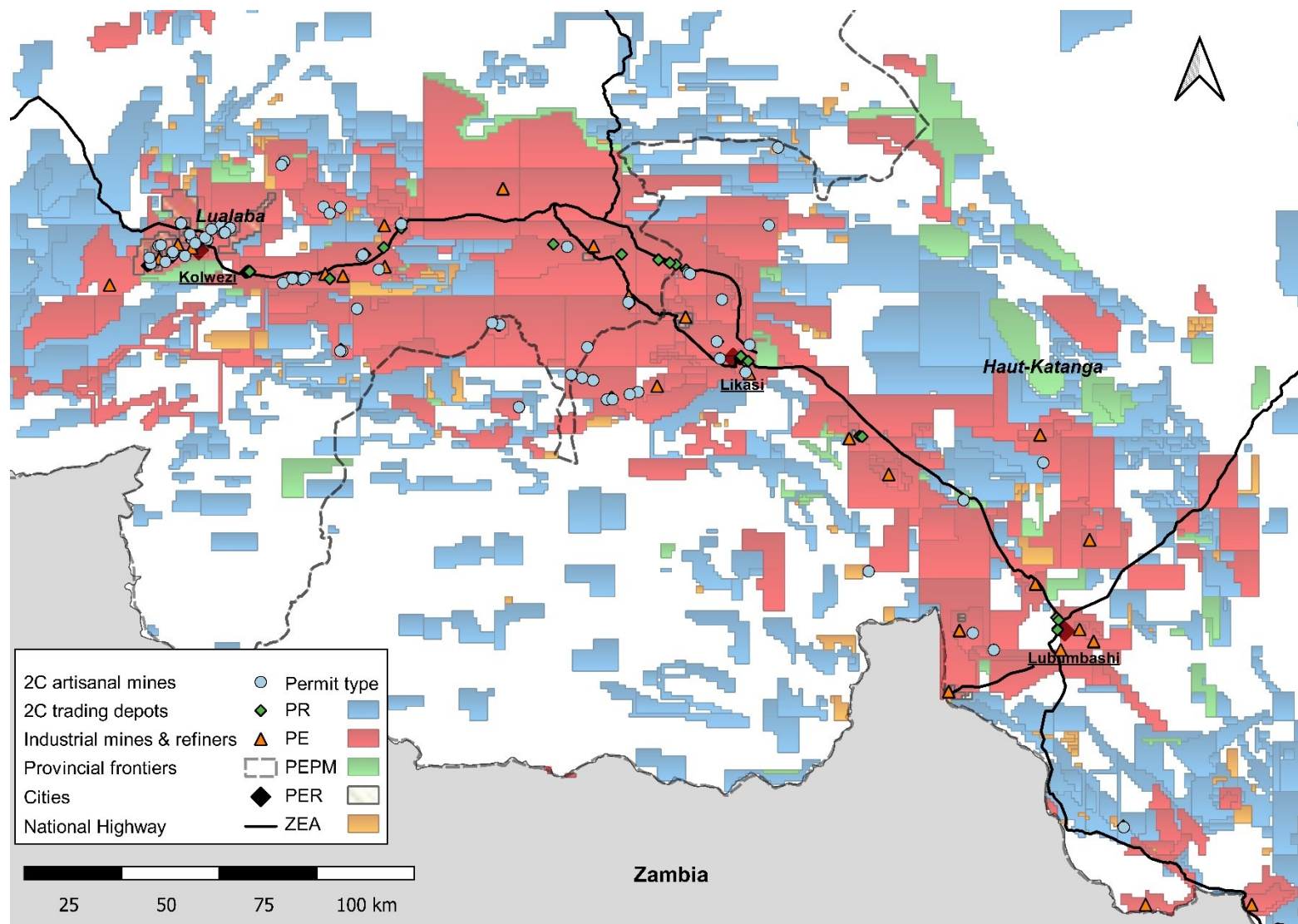


Figure 7. Cadastral map of the Congolese Copperbelt, the map shows the existing industrial mining permits in red. The areas in orange show ASM zones, so-called ZEA, which have been explicitly designated for artisanal mining. This shows that a large part of the area is already covered by mining or exploration rights and that there is little space for new ASM zones among the areas with already well-developed infrastructure or of known interest in terms of economic geology.

Organisation of mine workers in artisanal mining

The survey identified a total of 33 mining cooperatives on the included mines. These organised the artisanal miners on 41 of 53 visited mines. On three mines, the miners were organised in unofficial committees while on nine others the miners worked without official representation or organisation (Table 4). Both in relative terms (77% cf. 2019: 60%) and in absolute terms (2019: 35), there is thus a positive change compared to 2019 regarding the presence of cooperatives, a relevant criterion for ASM sector formalisation.

Table 4. Classification of the artisanal mine sites according to their level of organisation*.

Level of organisation	Number of miners
Mines with cooperative	41
Mines with committee	3
Mine sites without Organisation	9
Number of workers estimated	31,200
Number of registered mine workers	38,500

* A large part of the mine sites shows the presence of at least one cooperative, unofficial committees and non-organised or non-official mining groups exist also.

Table 5. Anonymised overview of the most important copper- and/or cobalt producing artisanal mine sites based on production figures for the months of September and October 2020.

Mine	Cu ore production t/month	Co ore production t/month	Share of Cu-ore production [%]	Share of Co-ore production [%]	Concession type
Mine 1	0	315	0	3.0	PE
Mine 27	1600	800	8.6	7.6	PE
Mine 33	1300	400	7.0	3.8	PE
Mine 34	4000	2500	21.5	23.8	PE / PER
Mines 35 & 36	0	640	0	6.1	ZEA
Mine 48	2000	3000	10.8	28.6	PE
Mine 54	1000	0	5.4	0	PE
Mine 49	800	80	4.3	0.8	PE
Mine 59	1600	0	8.6	0	PE
Mine 37	700	100	3.8	1.0	PE / PER
Mine 50	380	120	2.0	1.1	
Rest 43 Mines	5220	3185	28.0	24.2	
Total 53 Mines					

* In addition to the absolute production tonnage per month, the relative share of the monthly total production is also shown; these figures are based on the monthly production of September (Haut-Katanga) and October (Lualaba) 2020. At the mine level, production is always defined as the ore produced, not concentrated. However, it should be noted that production figures and the share of total production may be subject to fluctuations and inaccuracies. The figures are based on information collected at the mines during the survey.

Analysing the production shares of the different mines compared to the estimated total ASM production (see chapter Production), it turns out that eleven or twelve out of 53 mines (20-22%) account for the majority of production (Table 5). Five of these mines are located on

concessions of the state-owned Gecamines, two on an ASM zone and five other mines on the industrial production licences of international mining companies.

Compared to 2019, the shares and thus the economic importance of these mines have changed to some extent. Seven of these mines (four of them on Gecamines' concessions) were already among the most important copper and cobalt producers in 2019. However, the proportions have changed due to the omission of some mines that were still active in 2019, so that they have currently gained relative importance. In 2020, only one new mine, which was not active in 2019, is among the twelve most important mines; four other mines were already producing in 2019, albeit with smaller shares of total mine production.

A certain consistency can therefore be observed. Changes in the importance of the mines can be associated in particular with the closure of the Mutoshi project (Q4 2019). This consistency could thus encourage various economic actors as well as the Congolese administration to concentrate their efforts there together with the concessionaires, first and foremost Gecamines, as economic relevancy is an essential factor for sustainable development, improvement and formalisation of mining conditions.

Number of artisanal miners

The number of artisanal miners given in this study is usually based on estimates (as of September - October 2020). In only a few cases exact figures could be collected through cooperative registration, because after all, cooperatives do not organise mining everywhere. In addition, there are particular circumstances from mine to mine that can cause discrepancies between the number of working and registered miners (occasional workers, migrant workers, poor management of the cooperative during registration, several cooperatives on one mine, numbers are not up to date, etc.). On mines with cooperative presence, about 27,300 of the 31,200 estimated miners are working. Thus, almost 4,000 miners work in small teams in an unorganised way and, as a consequence, also necessarily act as traders in the sale of their production. However, the cooperatives reported having registered a total of 38,500 miners.

At 31,200, the estimated number of miners engaged in artisanal mining for copper and cobalt remains more or less consistent with 2019 (30,400). The discrepancy with the number of registered miners can be explained primarily by the suspension of mining activities at Mutoshi, one of the largest ASM mines.

The figures presented here refer to the sector covered by the study. Additional unknown mines and illegal miners extracting on industrial concessions may increase these figures, although it is not possible to estimate the actual number of people employed in the sector without any reference.

The almost stagnating numbers of employed miners between 2019 and 2020 could be well correlated with the insignificantly changed prices for cobalt and copper. On the other hand, based on the purchase prices registered in the field at the depot level, the hypothesis stands that locally better prices were paid in 2020 than in 2019 (Chapter 9). This would actually suggest an increase in the number of miners. The miners are still mostly not registered via the miner's card as required by law; only at two mines could miners could provide it.

Cooperatives

A noticeable restructuring of the cooperative landscape compared to the 2019 field survey is worth noting. A total of 21 of the cooperatives active in 2019 were no longer present on mines in 2020. In contrast, 19 new cooperatives were identified in the artisanal mining sector, even though some of these have been officially registered for several years. This change can also be observed on the mines that have already been registered in 2019. It is therefore not an artefact due to the addition of new mines and the removal of closed mines.

On the 25 new mines, both "new" cooperatives (11) and old, already producing cooperatives (11) are present. The already producing cooperatives have thus either expanded or changed their production sites. At 14 of the 28 mines already producing in 2019, changes were noted with regard to the cooperative(s) active there. Here, either the withdrawal of the cooperative (6 mines), the replacement of one cooperative by another (3 mines) or the presence of more cooperatives than in 2019 (3 mines) can be mentioned. No comparison could be made for two mines, as they were not accessible in 2019 and the existence of a cooperative was therefore not known.

At 16 of these already known mines, the miners are organised by already "established" cooperatives. There are cases where these cooperatives have displaced cooperatives working there in 2019 and other cases where artisanal mining was not yet organised in 2019. On the other hand, on only 7 of the already known mines new cooperatives have entered as replacements or are establishing themselves on previously unorganised mines (partial duplication of mines as multiple cooperatives can work on one mine and therefore a total of over 28). There is no cooperative present at a further seven mines, at four of which this is due to the departure of a cooperative, and at three mines mining is still taking place without organisation, as in 2019.

To what extent this restructuring is related to the change in the political environment or economic problems, such as liquidity shortfalls of buyers during the first months of the COVID-19 pandemic in 2020, can only be speculated. Reduced profitability may also be a reason, as the mineral deposit may no longer be profitable for organised artisanal mining and some cooperatives may have therefore decided to abandon mining activities.

Gender

Only at two mines did miners report the existence of a women's committee within the mining cooperative, while at ten mines women were admitted as cooperative members. Overall, 32% of the mines (17 out of 53) registered women in mining or mining-related activities (this includes trading with and supplying miners). The estimate of women employed in artisanal mining is about 1,000 (out of about 31,200 miners). The main activities are washing and processing ores, but women are almost as often involved in ore trading as intermediaries or run restaurants or small shops in the immediate vicinity of the mine, which is why they cannot be included in the number of miners.

At 38 mines, women were denied access to the mine, even if they were in a leading position within the cooperative or are buyers of the mined production. This is usually justified by local customs or superstitions. This automatically implies that women are discriminated against because of their gender and denied the opportunity to earn an income for themselves and their families through mining. Sexualised violence was not mentioned at any mine.

When asked about existing cooperative policies regarding the integration or promotion of women within the cooperative, the cooperative representatives at eight mines stated that women were excluded on principle. Reasons for exclusion are mostly conservative, traditional views or superstitions. At six mines, the integration of women into the cooperative was communicated as a policy, and at seven, the promotion of women within the cooperative towards more responsibility or improved income opportunities was stated as part of the gender policy. At 21 mines it was stated that no policy existed to this regard, and at twelve mines no cooperative was present.

State presence on artisanal copper-cobalt mines

With regard to state involvement, the presence of the legitimate authorities as defined by mining law and the "Manuel des Procédures de Tracabilité des produits miniers" (Ministère des Mines & Ministère des Finances 2014) was examined in particular. These include, at the supply chain level of artisanal mines, the SAEMAPE authority, the Division des Mines and the Mines Police (PMH). At 34 of the 53 mines (64%), representatives of all supervising authorities were encountered either permanently or on a regular basis, however, only five (9%) of these mines had the full presence of the designated supervising authorities and at the same time there security forces other than the Mines Police PMH were absent.

In addition to these "compliant" authorities, several state authorities or their representatives were mentioned or encountered at the mines that are not explicitly stipulated in the mining law. These are listed in Table 6. It is noticeable that in particular representatives of security forces were encountered or that their presence, whether permanent or sporadic, was indicated.

Table 6. Government agencies present on mine sites and the ministries responsible.

Mining	Defence	Interior			Finance	
SAEMAPE	Congolese Army (FARDC)	National-police (PNC)	Communal (Mairie)	Secret Service (ANR)	Local administration ETD	Revenue service Lualaba (DRLU)
DiviMines	Presidential Guard (Garde Republicaine)	Mine sites-police (PMH)	Border Patrol (DSF)	Secret Service of the Police (Bureau 2)	Traditional Chiefs (Coutume)	
	Secret Service of the Police (DEMIAP)	Territorial Administration (AT)				

* The term "coutume" is used here to refer to traditional leaders or their representatives. In the DRC, these are assigned to the Ministry of Internal Affairs

Thirty-five of the 53 mines (66%) were frequented by members of the security forces such as the army or police outside the PMH, or their presence was noted during the site visit, while a further three mines (6%) were frequented by tax authorities, local government representatives or traditional representatives for whom the legitimacy of their presence is not known (Figure 8).

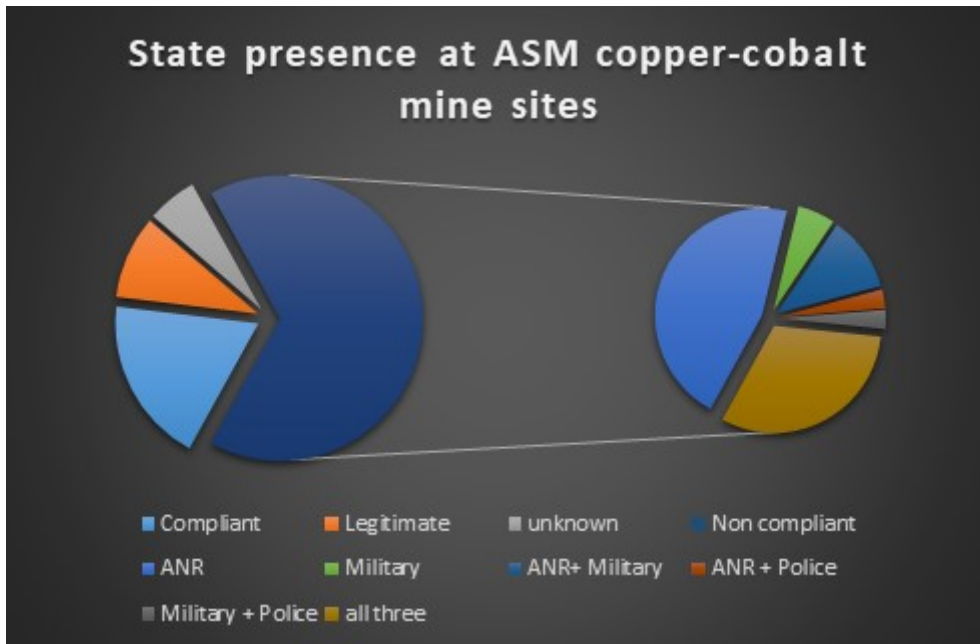


Figure 8. Classification of mines according to the presence of permissible and impermissible state authorities and other organisations according to mining law and accompanying ordinances. The total number of mines is 53. Definition of the classifications: "permissible": no impermissible authorities but also not all required permissible authorities (SAEMAPE, DiviMines, PMH) are present. "compliant": all permissible authorities and no impermissible authorities are present, "impermissible": security services, apart from the PMH mine police, are present on the mine.

Compared to 2019, the presence and thus implicitly the potential influence on commodity supply chains by state authorities at the level of artisanal mines has decreased in absolute but not relative terms (cf. 17 mines / 29% in 2019), as in 2020 on 15 mines (28%) their presence was not confirmed. However, as in 2019, it is still a fact that during the field visit it was not possible to assess to what extent the presence of the security forces might be necessary and why the presence of the PMH Mine Police alone might not be sufficient to guarantee public safety.

In contrast, the presence of legally required authority representatives has increased significantly (2019: 7 mines 12%, 2020: 34 mines 64%). However, accident figures (see Chapter 10 on risk assessment) and inconsistencies in taxation do not allow to draw the conclusion that their presence has automatically and broadly improved control and compliance with mining law and other aspects relevant in terms of due diligence. This again raises the question of the extent to which the capacities of the regulating authorities are sufficient to at least adequately control the sector in terms of occupational health and safety and due diligence despite its informal character.

In this regard, it is striking that on 14 of the 16 mines where children were found to be present or working, at least one authority was exercising its supervisory duty. A similar statement can be made about the mines where fatal accidents occurred in the last twelve months. Here, at least two authorities are represented on all 19 mines with registered or reported fatal accidents. At the same time, it can be assumed that probably no accidents are reliably registered if the authorities are not present on site at all.

Levies and Taxes

The contributions or levies paid to the cooperative by miners vary greatly in nature and amount, mostly fixed at percentages from 8 to 30 % of the turnover (Figure 9). However, there are also fixed rates (100 - 500 \$ per small truck or 10 bags of the week's production).

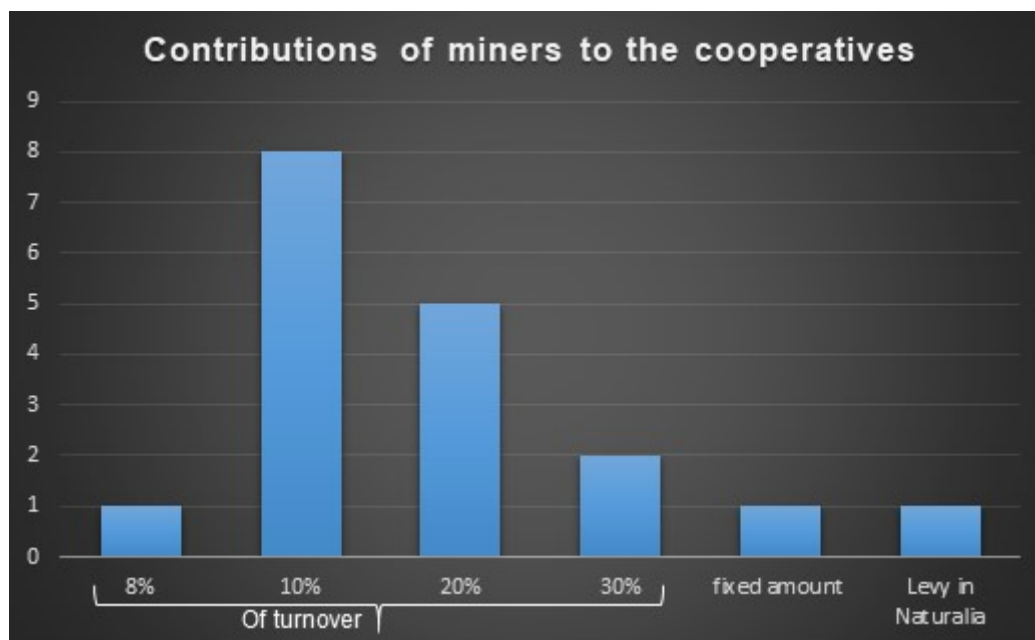


Figure 9. Histogram of the common levy agreements in the copper-cobalt ASM sector between miners and mining cooperatives.

Information on tax payments or levies was collected at 43 mines. According to this information, on 24 mines no taxes or levies are paid directly at the mine, but on 19 mines they are. In most cases, these taxes are calculated according to a fixed amount per departing truck or motorbike transporting ore. The amounts vary widely between mines (\$100 to \$300 per truck), even if the same authorities collect these taxes. In one case, levies were also paid in kind (several bags of ore per week). In addition to payments to the authorities required by mining law, i.e. SAEMAPE, Division des Mines and PMH (payment of the so-called "Frais Rémunérateur pour Services Rendus" as well as fees for transport documents), levies are also paid to various security agencies. These are paid on about 6% of the mines (3 out of 53 mines) and vary in amount between 100 and 5000 CDF per bag and between 10,000 and 15,000 CDF per motorbike used for transportation.

Only at five of the 19 mines levies are paid at the so-called "guichet unique", a centralised point of reception. At three of the mines, the traditional leaders demanded varying amounts as tax per departing truck.

The extent to which the army, secret service and police are allowed to receive levies from mining is not apparent. At the time of reporting, no legal text is known in this context. It is also not known what services are provided in return for these levies. However, in consideration of this not very widespread practice and the varying amounts from mine to mine, it can be assumed that these are individual and not systematically organised incidents.

6. Description of Trading Depots

At the level of the trading depots, interviews for the purpose of data collection were conducted exclusively with the depot operators or their senior deputies. 118 depots were inventoried in Haut-Katanga and Lualaba provinces, only two of the depots denied any information and access.

A total of 80 different owners were named during the interviews and were captured in the registries. However, it was often mentioned that the named owners are informal representatives for foreign buyers in the background, as only Congolese are allowed to trade commodities at the depot level (Journal Officiel 2017).

Some of these owners manage several depots (Figure 10); Table 7 provides an anonymised overview. The 20 owners listed there, as well as four other owners of larger individual depots, sell more than 60% of the total copper and cobalt ores sold through depots to buying refineries and smelters (62 depots).

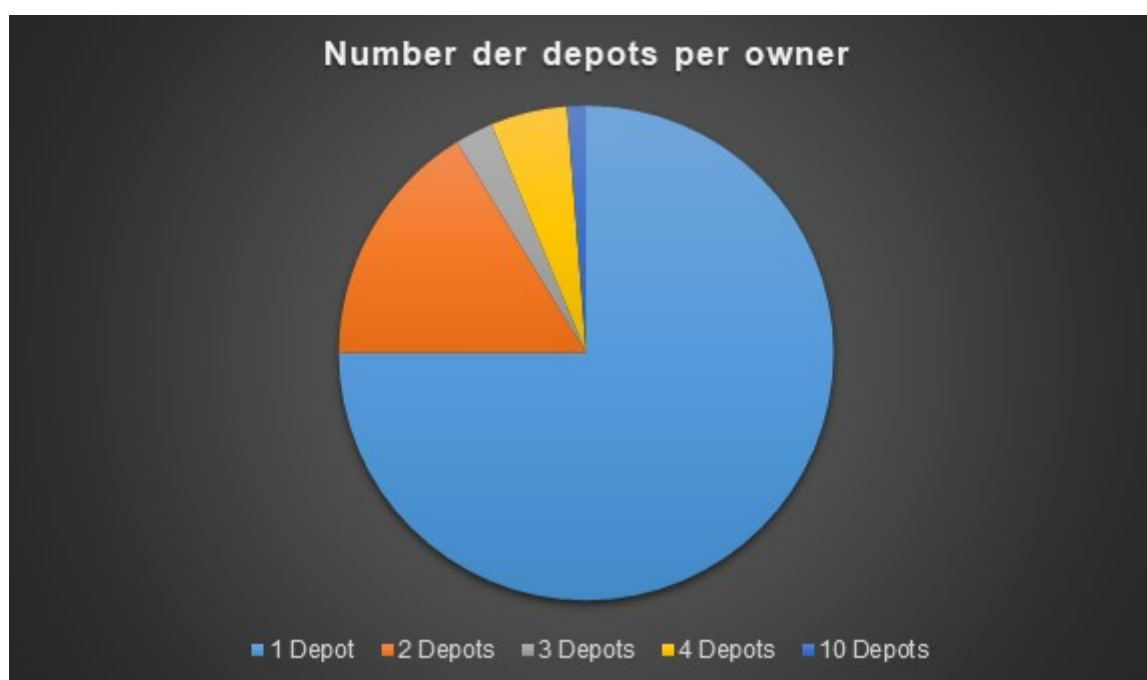


Figure 10. Ownership structure of 116 depots. A large part of the 80 registered owners operates only on one trade depot.

Table 7. The number of depots and their relative share of traded ore tonnage listed by the most important owners (anonymized).

Owner	Ore purchase	Number of depots	Number of local buyers	Same buyer at all depots	Share of sold Cu-ore tons [%]	Share of sold Co-ore tons [%]
owner 70	from everywhere	10	9	no	4.3	3.8
owner 67	from everywhere	4	5	no	7.0	0
owner 69	from everywhere	4	1	yes	4.5	0.5
owner 15	from everywhere	4	4	partially	1.9	2.3

Owner	Ore purchase	Number of depots	Number of local buyers	Same buyer at all depots	Share of sold Cu-ore tons [%]	Share of sold Co-ore tons [%]
owner 11	from everywhere	4	3	partially	5.2	8.5
owner 66	Mine 4 Mine 5 Mine 7	3	1	yes	10.4	0
owner 44	unknown	3	3	partially	2.5	2.8
owner 68	from everywhere	2	3	partially	0.7	1.8
owner 65	unknown	2	4	no	0.5	2.1
owner 60	from everywhere	2	2	partially	1.5	2.8
owner 49	Mine 5 Mine 9	2	4	yes	1.9	0.8
owner 43	from everywhere	2	5	no	0.7	7.3
owner 1	only partially known	2	2	yes	0.4	3.6
owner 9	only partially known.	2	3	no	1.5	2.1
owner 14	Mine 33	2	1	yes	1.9	0
owner 17	only partially known	2	4	partially	4.1	1.1
owner 19	from everywhere	2	3	no	1.8	2.0
owner 29	Mine 49 Mine 51	2	1	yes	0.8	0
owner 39	only partially known	2	1	yes	1.0	0.2
owner 53	only partially known	2	4	partially	2.5	0.2
owner 45	unknown	1	1	-	1.1	7.8
owner 74	Mine 35 Mine 36	1	1	-	0	7.3
owner 32	from everywhere	1	1	-	0	5.9
owner 28	from everywhere	1	2	-	4.6	0.4
56 other owners	-	1			39.4	36.8
80 owner in total						

* In addition to the economic scale, the trade relations are shown and whether the different depots of individual owners supply the same refineries.

In addition to private individuals with no known company affiliation, ten depots belonging to mining cooperatives and ten depots belonging to mining companies or refineries were identified. Except for three of these depots, belonging to two different mining companies, these exclusively supply their owners. The other two mining companies did not have their own processing capacities at the time of the report.

Most of the depots were opened between 2018 and 2020 (95). It should be noted that by mid-2019, most of the depots outside Kolwezi and Likasi were destroyed by the army. Of the 118 depots existing at the time of the survey, 75 were established in the second half of 2019, including some in Musompo near Kolwezi (a total of 39 active depots).

A total of 54 depots bought both copper and cobalt ores, 45 depots bought only copper ores and 17 depots accepted only cobalt ore.

State presence and taxation at trade depots

The presence of government authorities was also examined at depot level. The controlling authorities required at this supply chain level are:

- SAEMAPE (Artisanal and Small-scale Mining Authority)
- Division des Mines (Mines Department)
- Police des Mines et des Hydrocarbures PMH (Mines Police)
- CEEC (Commodity Trade Inspection and Export Authority)

CEEC is an authority responsible for the certification and documentation of transformed or processed mining products and intermediate products such as concentrates, and issues the corresponding export documents (mining law). Like SAEMAPE and the Division des Mines, this authority is part of the Ministry of Mines. The presence of the authority representatives is shown in Table 8 as an overview, whereby "present" was defined as those who are either permanently or regularly present on site.

Table 8 Presence of the supervisory authorities provided for in the mining law at the level of trade depots in the copper-cobalt sector.

Agency	Present	Not present
SAEMAPE	110	6
Division des Mines	114	2
PMH	115	1
CEEC	107	9

The trade depot managers frequently mentioned the presence or regular visits of several representatives of authorities from different ministries. It should be taken into account that, for example, authorities from the Ministry of Labour, the Ministry of Finance or the Ministry of Foreign Trade have to carry out inspections. Table 9 lists the authorities encountered or mentioned by the depot representatives, as well as possible reasons for their presence. Within the framework of this study, no detailed investigation of this issue is possible. It is noticeable that the number of authorities decreases with increasing distance from the cities or depot agglomerations, and that primarily security agencies were mentioned or encountered.

In the Lualaba province, the authority MAMICO was also encountered, which only exists at the provincial level and collects fees for the supervision of carriers and loaders. However, no legal basis or statutes could be consulted regarding this authority. At the time of reporting, this authority continues to be the recipient of levies, but the known offices have been closed down.

Table 9. List of authorities intervening at the level of copper-cobalt trade depots and responsible ministries.

Ministry	Agency	Mandate
Mining	Small-scale Mining agency (SAEMAPE)	issuing documents , traceability
	Mining Division	
	Export certification (CEEC)	
Foreign trade	National office of standards (OCC)	gaging, calibration and quality analysis for the Export
Finance	Customs tax agency (DGDA)	customs
	Tax agency Haut-Katanga (DRHK)	taxation Haut-Katanga
	Tax agency for administrative taxes(DGRAD)	taxation
	Tax agency Lualaba (DRLU)	taxation Lualaba
Defence	Army (FARDC)	not known
	Secret service of the army (DEMIAP)	not known
Labour	National Social insurance service (CNSS)	registration of employees
Science	National Atomic Energy Authority (CGEA)	control of Radioactivity
	National Radiation Protection agency (CNPRI)	not known
Interior	Secret Service (ANR)	not known
	Migration Agency (DGM)	work visa of expat employees
	National police (PNC)	not known
	Secret service of the police (Bureau 2)	not known

However, similar to the situation on artisanal mines, it is also unclear to what extent the presence of security forces and the levies they sometimes collect are justified at the depot level. Furthermore, the question was raised which and whether levies and taxes were imposed. In order to better understand this, one should first consult the text box "Guichet unique", Fee payments & allocation formula at mine and depot level on the taxation of artisanal production. It is striking that at depot level, the ANR intelligence service charges fees per departing truck at almost all depots (90 out of 116 depots). The fees vary greatly in amount (9,500 CDF to 50,000 CDF).

With regard to the levies to be paid to the authorities of the Ministry of Mines, there are discrepancies in terms of consistency and method of payment, especially when comparing between the two provinces of Lualaba and Haut-Katanga. In Lualaba, all levies are paid at the central collection point ('guichet unique') in accordance with the requirements of the mining products traceability guide ('Manuel de Tracabilité') and the tax code in force. The amount is reportedly \$100 per truck, \$400 when transferring to the neighbouring province of Haut-Katanga.

In Haut-Katanga Province, on the other hand, the levies amount to highly variable amounts for the same documents (transport documents), between \$18 and \$250 per truck. According to the depot operators, the payments are made either on site or at the respective authorities' offices. In addition, the traditional leaders of the areas where the depots are located receive levies of different types, amounts and regularities.

Twelve depots have to pay levies per truck (between CDF 7,000 and CDF 80,000), 21 depots pay monthly levies regardless of the number of trucks (between CDF 50,000 and \$300), 17 depots pay weekly levies ranging from CDF 10,000 to CDF 20,000, but most of which were not specified. Six depots reported sporadic and irregular contributions to traditional leaders. For 54 depots, no information was provided in this regard, and for six depots, information that could not be used was provided. This means that a total of 56 depots (48%) pay levies to traditional leaders, which are, however, not provided for by law. To what extent these levies from the chiefs benefit the common good of their community could not be assessed within the framework of the present study.

"Guichet unique", fee payments & allocation key at mine and depot level

According to the Mining Law and the mining products traceability guide ("Manuel de procédure de traçabilité"), at mine site level it is foreseen that a centralised payment is to be made for the services provided by the authorities at the central collection point ("guichet unique") of the SAEMAPE authority, which is followed by the distribution of collected fees according to the defined allocation key.

According to the Mining Ordinance, the distribution key is always 60%/40% between SAEMAPE and other authorities, whereby each province can in turn decide on the distribution of its share of 40%. The percentages and levy levels can be adjusted via inter-ministerial decrees at national level (Mines Ordinance 2018). The distribution key of the Lualaba province deviates from the 60-40 regulation.

- Fees for Haut-Katanga at 1% to 8% Cu 15\$/t and starting from 9% Cu 22\$/t., whereby the decree does not specify a fee structure dependent on the cobalt content.
- Lualaba fees: \$100 per truck intra- & \$400 per truck extra-provincially

Table 10. Allocation key of levies at mine site level for the Haut-Katanga and Lualaba Provinces.

Receiver of fees	Percentage Haut-Katanga	Percentage Lualaba	Percentage Haut-Katanga
SAEMAPE	60	20	
Other agencies	40		100 (of the 40%)
Division des Mines		20	20
Fees for road maintenance		15	30
ETD		15	15
Province		20	20
FPPM*		10	15

* Fonds de Promotion de la Petite Mine

Depots Haut-Katanga and Lualaba

The term depot is not a term defined in mining law. The depots are equivalent to the so-called "Entités de traitement" from the 3T sector in the east of the DR Congo. However, the degree of processing for copper and cobalt ores is in no way comparable to the 3T ores; the metal contents are delivered to the refineries and smelters in a much less concentrated state. Table 11 shows the distribution key for fees and taxes.

Transfer costs from depot to refineries in Haut-Katanga (no data for Lualaba).

- 4\$/t same town/city
- 10\$/t same province, other town
- 14\$/t transport across provincial border

Table 11. Allocation key of levies at trade depot level for the Haut-Katanga and Lualaba Provinces.

Receiving agency	Percentage Haut-Katanga	Percentage Lualaba	Percentage Haut-Katanga
SAEMAPE	60	20	
Other agencies	40		100 (der 40%)
Division des Mines		20	20
Fees for road maintenance		15	30
ETD		15	15
Province		20	20
CEEC		10	5
FPPM*		20	10

* Fonds de Promotion de la Petite Mine

7. Structure of Local Supply Chains

The following descriptions of the different actors in the intra-Congolese supply chain have been divided into tiers according to their position in relation to the local exporter. The division into four tiers is based on the change of ownership or responsibility for the traded production. For example, when a cooperative working on a mine sells ore to a mobile intermediary and then the ore is sold on to a depot, three changes of ownership and thus three different tiers are involved in this process (tier 4 to tier 2).

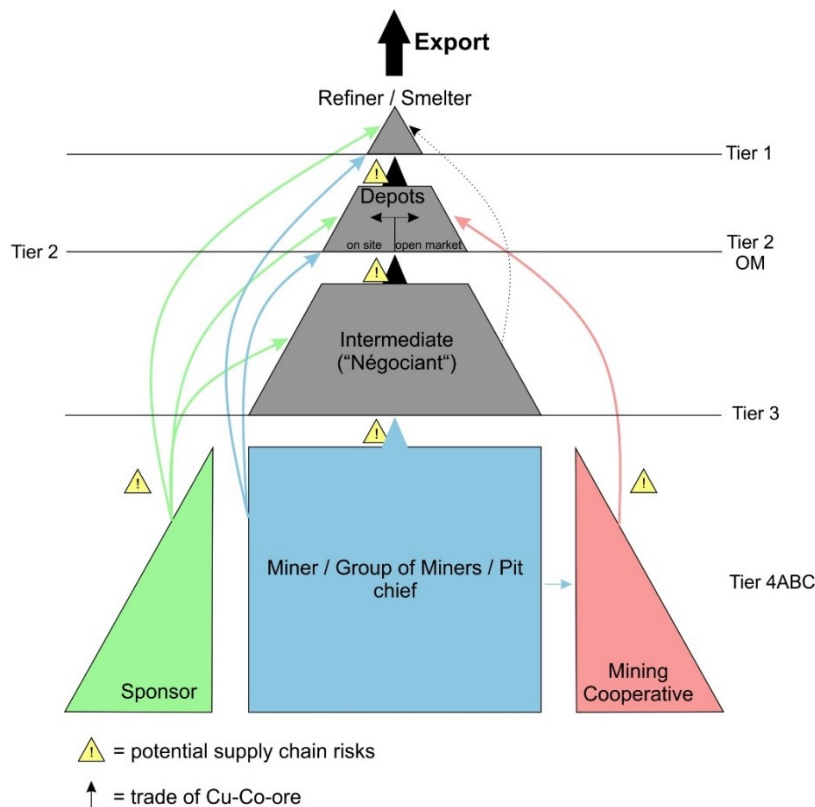


Figure 11. Supply chain pyramid and tiers in relation to the final exporter from the DR Congo. The different actors of the domestic supply chain are shown, in colour the actors of the supply chain Tier 4, which is the focus of this study, are shown. The arrows represent possible trade relationships between actors, the thicker arrows in the central axis indicate the most important trade channels. Furthermore, the possibility of existing risks with regard to due diligence compliance is shown for all trade relationships.

Sellers and buyers at the artisanal mine sites

Tier 4

At 49 mines, individual miners or smaller groups (teams per pit or adit) sell the copper-cobalt ore; at one mine, the mining cooperative acts as the seller; at three mines, no reliable information could be provided. In terms of buyers of the production, either depots located directly near the mine (at 21 mines) or mobile intermediaries (16), or both (6) are the primary trading partners. Other buyer types were cooperative (1), central trading centre (2), the exporting refinery (2), or sponsors (1).

This shows that the types of actors already described in the 2019 report still exist in the domestic cobalt supply chain (cf. BGR 2019). However, the dominance of individual miners,

mobile intermediaries and depots as principal actor types became clearer, whereas cooperatives as commercial actors and sponsors are of little to no importance (Figure 11).

Mobile Traders/ Intermediaries

Tier 3

The role of mobile intermediaries and their relationships with other actors could not be analysed in detail in the present study. The primary reason being that their mobility and, in part, their informality make it difficult to capture sufficient intermediaries and to reflect a representative analysis of this group.

As a link between mines and commercial depots, their role in the trade of copper-cobalt ores is undisputedly relevant, as transport, accumulation of mine production as well as the (pre-) financing of miners is carried out by or through them within the framework of the currently existing supply chain structure.

Nevertheless, not all intermediaries are necessarily registered and it is not clear to what extent they contribute to the fact that the mines' production is very dispersed among many depots and subsequently refineries. Although they have a right to be part of the supply chain under Congolese law, their sheer number, their mobility and business relationships that are difficult to understand as an outsider, can affect the transparency of these supply chains.

Trade Depots

Tier 2

The identity of the artisanal miners or intermediaries selling copper and cobalt ores is always or partly known to most depots (always 91; partly 7). The miners usually identify themselves at the depot through their electoral card ("carte d'electeur"), which is de facto equivalent to an identity card in the DR Congo. In addition, the miner's card ("carte de creuseur") or the registration card of the intermediaries ("carte de négociant") may also be consulted. However, some depots do not identify the sellers via documents, but simply due to the fact that seller and buyer already know each other through long-standing trade relations. Thus, for 25 depots, the identification of the seller is done without any document, resulting in the fact that an actual document-based identification is only done at 66 depots (instead of 91). For 18 depots, no attention is paid to whether the identity of the seller is known or proven.

At the depot level, as at the mine level, it was investigated which actor type in the supply chain acts as the seller of the delivered ores. In many cases, several types of actors were named per depot. In 90 depots individual miners sell their production, in 74 depots mobile intermediaries. Twenty depots buy material from cooperatives, one depot from a sponsor. On the other hand, 30 depots have entered into formal partnerships with cooperatives, either in the form of exclusive rights or because the depot operates as a branch of the cooperative.

The depot managers of 56 depots stated that they cooperate with and pre-finance mobile intermediaries, of which 23 also stated that they pre-finance miners or production teams. A further 29 depots, while not financing intermediaries, also engage in the pre-financing of individual miners.

Transporters & Logistics companies

Tier 2 to Tier 1

Thirty-five transport companies or private individuals handle transport from the depots to the refineries (Figure 12). Whether or not these companies are registered could only be determined for four companies after checking the commercial register. Furthermore, integrated logistics departments of nine refineries that procure and process copper and cobalt ores from Congolese artisanal mining are also involved in transport. For 19 depots, no information was given on who organises or takes over the transport of copper and cobalt ores.

The transport of ores and concentrates is mostly intra-provincial, i.e. depots from one province supply refineries in the same province. This is certainly due to the high transfer fees and logistics costs. Only 24 depots (20 %) from Lualaba Province supply refineries in Haut-Katanga Province, but of these, seven depots supply different refiners depending on the commodity. This is mostly related to fixed supply chain relationships between depot operators or cooperatives and the refineries.



Figure 12. Typical transport vehicles from mine to depot or to refinery (top left). The different types of vehicles also give an impression of the size of the transport companies, smaller vehicles like vans are more likely to be used by smaller and possibly informal intermediaries. Motorbikes are more likely to be used by mining teams to transport smaller volumes.

Refineries (Producers of export ready pre-concentrates)

Tier 1

A total of 18 different companies exporting concentrates and hydro- or pyrometallurgical pre-concentrates were identified as buyers and processors of copper or cobalt ores from ASM. For four of these companies, no information exists regarding their processing capacities or production statistics. Two of these companies are at least listed in the mining cadastre as owners of exploration licences for copper and cobalt. In 2020, a total of 44 actively exporting companies were listed; companies with export licences but without exports recorded for 2020 were not included here.

Table 12 lists the corresponding refineries and smelters, as well as their approximate share of Congolese total exports. This shows that 14 refineries and smelters, which in total produce about 20 % of copper or cobalt exports from the DRC, also process artisanal ores and integrate them into their supply chain in a processed form (cathodes or hydroxide).

Table 12. List of refineries and smelters, which buy and process ASM-production as well as respective export products.

Refinery code	Copper export share (%)*	Cobalt export share (%)*	Export products
Refinery 1	5.9	6.7	Cathode, „Cuivre Noir“ ^{***} , Blister Copper, Cobalt hydroxide
Refinery 2	0.9	4.0	Cathode, Cobalt concentrate, Cobalt hydroxide
Refinery 3	1.5	0	„Alliage blanc“ ^{****} , Cu Noir
Refinery 4	2.2	0	Cathode
Refinery 5	0.2	0	Cathode
Refinery 6	0.7	0	Cathode
Refinery 7	1.6	0.4	Cathode, Cobalt hydroxide
Refinery 8	0.3	2.6	Cathode, Cobalt hydroxide
Refinery 9	0.6	0	Cathode, Copper concentrate
Refinery 10	1.1	0.9	Cathode
Refinery 11	3.1	0	Blister Copper
Refinery 12	1.1	1.5	Cathode, Cobalt hydroxide
Refinery 13	0.8	5.1	„Alliage blanc“, Cathode, Copper concentrate
Refinery 14	0.3	0	Cathode, Copper concentrate
Refinery 15	?	?	?
Refinery 16	?	?	?
Refinery 17	?	?	?
Refinery 18	?	?	?
Total**	20.2	21.1	

* Share of national total exports, by total metal content

** Cuivre noir or black copper are impure pyro metallurgical produced copper pre-concentrates and are distinguished from Blister Copper (~ over 90 to 98%) by lower copper grades (~60-85%).

*** Alliage blanc are alloys of copper and cobalt with varying metal contents (approx. 10 - 30 % Cu and 10 - 30 % Co). Alloys designated as alliage blanc that contain nickel or germanium are not relevant in this study.

Supply chain actors

As a result of the previous analyses, a total of 162 actors are currently involved in the intra-Congolese supply chains for artisanal copper and cobalt. These are distributed over 183 possible locations in the supply chain. It should be borne in mind that these figures may have changed between the time of the field survey and the time of the report. Furthermore, there is no claim to complete coverage.

Table 13. Actors at the respective supply chain level, as well as the number of actors at each level.

Intra-DRC supply chain tier	Supply chain level		Type of actor	
Tier 1	refineries & foundries	14 (18)	exporters	14 (18)
Tier 1-2			transporters	35
Tier 2	depots	116 (118)	owners	80
Tier 3	traders	unknown	traders	unknown
Tier 4	mine sites	53 (67)	cooperatives	33
Total		183 (203)		162

* The numbers in brackets show the recorded total number of individual actors per type of actor in the supply chain level. Mine sites, depots and refineries, where no information was available are added here also.

Supply chain relationships and origin

The origin of the traded ores was also examined as part of the study. The name of the mine and, in the case partnerships existed, the name of the mining cooperative were registered. This information was cross-checked with the information from the questionnaire for artisanal mines. The origin of the purchased material was completely known for 38 depots, for 44 only partially. In 34 depots, the origin of the material was unknown; here, mostly rough geographical indications such as "Tenke" or "Kakanda" were given, or the statement that the production was accepted from "everywhere" without questioning the origin.

34 depots only bought production from one known mine while 12 depots bought from several mines known to the depot. In conclusion, insufficient information on the origin of the material was obtained from 70 depots. Documents of government traceability could rarely be consulted. In some cases, however, it became apparent that false declarations, under-declarations or re-declarations to other producers and mines as well as tonnages were taking place, some of which appear to be systematic in nature.

The refineries and smelters buying the artisanal ore could be identified for 112 depots; for four depots it could not be determined who buys the ore they sell. Thus, the supply chain relationships for the trade of copper and cobalt ores from mine to depot to crude refiner can be traced in parts. However, it was not possible to precisely allocate material flows (as mass flow) from the mine to the export to the different actors, as especially the depots and intermediaries act as dispersing factors from the mine to the depot and from the depot to the refinery.

Figure 13 illustrates the mutual trade connections within the sector and the multitude of existing supply chain relationships (374 mine - depot - refinery relationships in total). Just as one mine may supply several depots, or several mines several depots, one (or several) depot may also supply one or several refineries and smelters. So-called closed-pipe relationships from one mine via a depot to one refinery were identified six times, but at the refinery level, production is then again mixed with other mines, which in turn also supply other depots and refineries.

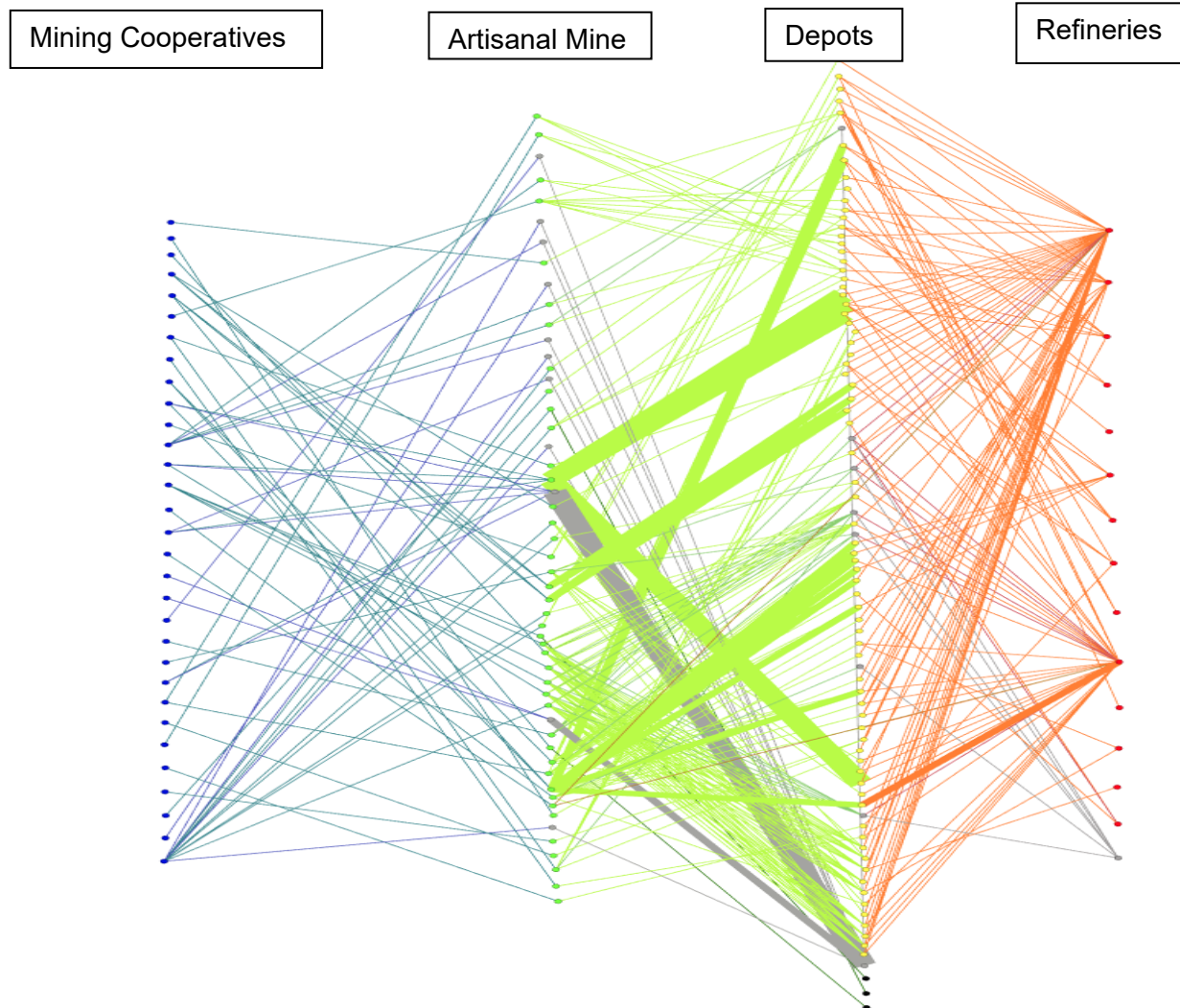


Figure 13. Commercial relationships from cooperatives to their mines to depots to exporting refineries. It can be seen that the supply chain relationships are complex and dispersed. The grey lines represent relationships that could not be connected to actors of the following level.

Method for linking supply chain data from the artisanal mine & depot questionnaires

The data from the mine survey was checked for coherence and parallels with information from the data resulting from the depot survey. Thus, attention was paid to correlations between two independent, mostly separated from the mine site in terms of ownership and geographical location, sources.

Regarding questions on supply chain relationships, similarities were found in particular between the names of the buyers (from the mine survey) and the names of the mines related to the question on origin (from the side of the depot operators). The information regarding partnerships between depots and cooperatives or depots and exporters also showed great similarities between the two questionnaires. Nevertheless, the information from the depots' questionnaires is considered to be more precise and correct than the information on the mines. This is due to the fact that at the level of the depots, only the managers or executive officers were spoken to and their information is considered more reliable.

Miners or cooperative representatives on the mine site level sometimes do not know exactly who their commercial partner is. In addition, mobile intermediaries are often interposed between the depot operators and the miners as a supply chain link, and the miners could often only give their names.

Supply chain models

Based on the situation presented here, several supply chain models can be derived for the local supply chains of copper and cobalt in the DRC. Figure 14 illustrates these schematically.

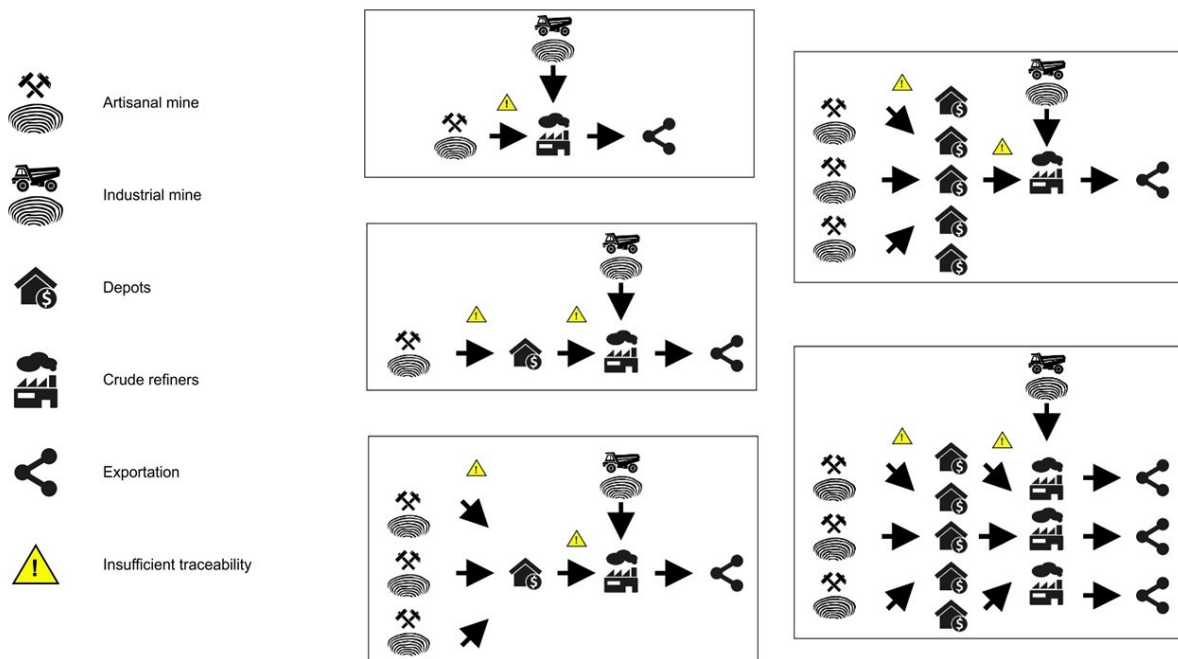


Figure 14. Simplified representation of existing supply chain models for copper and cobalt in the ASM sector. Artisanal mining is always linked to industrial exporters - the diagrams point to the variability and multiplicity of actors at the different supply chain levels and show that this complexity can pose risks and correspondingly challenging management.

The complexity of commodity flows can increase rapidly immediately after extraction and without reliable tracking, supply chain understanding and risk management can be difficult or impossible for downstream companies, especially those downstream of the crude refineries in the DRC. In-country processing into higher valued (pre-)concentrates without indication of the extraction method and corresponding mass balancing on the part of the crude refineries hampers any in depth risk assessment.

8. Technical Aspects

The mines investigated were classified into copper mines, cobalt mines and copper-cobalt mines with regard to their primary and secondary ore production. The criteria for this were the metal content of the ores and the tonnages produced per month. For example, low or non-declared tonnages and metal contents of copper ores automatically result in the classification as a mine that primarily mines only cobalt. Mines producing both ores were classified as primarily mining copper and secondarily mining cobalt, similar to industrial mining. The subdivision of the mines according to primary and secondary raw materials produced is shown in Table 14. Gold was extracted as a by-product from three mines (approx. 25 kg per month).

Table 14. Classification of the 53 active artisanal mine sites mapped in 2020 listed by ore(s) produced.

Primary and secondary commodities	Number of mines
Copper & Cobalt	15
Copper	23
Cobalt	15

Estimation of the artisanal production

The estimated artisanal production of copper and cobalt (Figure 15) is based on observations by the field teams and statements made by interview partners. At some mines, documents from cooperatives or authorities, e.g. statistics or tables, regarding production could be viewed. In most cases, no documents existed where the production was not purchased locally, or access to such documents was denied.

The estimated annual production tonnages are given as metal content. For this purpose, the indicated ore tonnages were offset against the arithmetic mean of the respective metal content (copper/cobalt). Furthermore, the information on produced tonnages had to be extrapolated to an annual production, as only the monthly production was inquired on in order to be able to verify the plausibility of the data by means of direct observations by the field teams (number of miners, number of shafts, size of the mine, estimated tonnage on stockpile, number of transporters and vehicles). Monthly production is of course subject to fluctuations; extrapolated over the year, the results of the projections were therefore rather conservative.

Fluctuations throughout 2020 may be seasonal (rainy and dry seasons) or due to the COVID-19 pandemic, as trading activities in April and May were weakened by cautious behaviour of buyers regarding an unclear demand situation on the international market. Also, the artisanal Mutoshi mine had still been producing in the first two months of 2020; this mine alone represented a relevant share of the national mine production of cobalt in recent years.

With regard to the indicated average metal contents, which are necessary for the calculation of the produced tonnages of metal contained, it is important to bear in mind that these are mainly taken from the statements of miners, who refer to the results of the traders' portable X-ray fluorescence spectrometers. The miners often complain that these readings would be manipulated.



Figure 15. Copper ore (left) already crushed and cobalt ore milled (lower right) or unprocessed and ready for transport (upper right).

In addition to these accusations of manipulation, however, there are also objective, technically or methodologically determined limitations in the accuracy of the measurements of these spectrometers that must be taken into account. On the one hand, the measurement result depends on the properties and preparation of the measured sample. If the sample is insufficiently ground, the measurement cannot be carried out correctly.

Furthermore, poor choice of the aliquot (partial portion of a sample) and its homogenisation can lead to measurement results that do not represent the delivered production at all. Some depot operators may measure one sample per bag, others may measure only one sample per batch, which is then assumed, after brief visual inspection, to be approximately representative of what is in all the batches bags. However, if the sampling for the determination of the metal content is done correctly, the instrument is in good condition and correctly calibrated, the accuracy of the measurement can be 96% for copper and 94% for cobalt. On the other hand, devices can also have different technical parameters or defects that cause them to deliver results that differ from each other in terms of measurement accuracies.

The reliability of the information provided by the miners must be considered low, as it was not possible to accurately follow, at depot level, how expertly and correctly the analysis are carried out. However, within the scope of data collection at depot level, the information provided by the depot operators could also be taken into account and compared with the statements of the miners. On average, the information on metal content of cobalt ores sold or purchased is consistent. In the case of the copper ores, however, there was a relevant discrepancy of over 2%. The average metal contents at ASM level are given as 10.1% copper for copper ores and 3.5% cobalt for cobalt ores, but the depot operators gave metal contents of 12.3% copper and

3.1% cobalt. The fact that the depot operators report higher metal grades for copper than the miners assuming fraud in the grade determination seems to invalidate the miners' claim.

Discrepancies were also found in the comparison between the figures for ore tonnages sold (ASM level) and resold (depot level). For example, the artisanal mines produce 18,600 t of copper content and 10,500 t of cobalt content over the course of the year. In contrast, the depots report a total sales tonnage of 10,470 t of copper content and 6,150 t of cobalt content.

This difference in tonnages could be explained by several factors. On the one hand, in the course of pre-sorting and quality control, the depot operators will not accept a part of the delivered ores or dump the uneconomic part of the production on stockpiles in order not to transport uneconomic material (low-grade ore) to the refinery at high costs. However, there are also mines that deliver their production directly to the refineries via cooperatives and therefore these tonnages are not registered at the depot level.

The depots' data are probably based on more realistic and accurate data, as the management level at the depots is considered better than at mines with no or poorly organised cooperatives. In addition, depots take into account factors such as minimum ore grades required for resale. On the other hand, at depot level, systematic under-declaration of tonnages to reduce transport fees and taxes due when crossing provincial borders cannot be ruled out.

It should be mentioned in this regard, however, that the question of whether and on what basis statistics on production and transport are collected at the level of the depots was also examined in the course of the survey. Although statistics are collected by the state at 114 of the 116 depots to be considered, the regularity and methodology for determining tonnages vary. For example, officials document production on a daily basis at 107 depots, but only on a weekly basis at eight depots (one depot did not provide any information). The statistics for 102 depots, are based only on estimates of truck tonnages (e.g. loaded big bags) and declarations. Exact measurements by weighing the departing transporters are only carried out in six cases.

Taking into account all these factors influencing the production estimates, this report does not commit to one figure but presents two minimum-maximum scenarios marked by the tonnages mentioned (copper ore: 10,470 t to 18,600 t; cobalt ore 6,150 t to 10,500 t). Projected to the year 2020, these scenarios would account for an ASM share of 3 to 5 % of total cobalt exports in 2020 (2,600 - 4,400 t cobalt content). For copper, the share would be between 0.5 and 1.4% of total exports (7,500 - 22,500 t copper content).

Comparing these estimates with the export figures of exporters who process and export ASM production, the above estimate of ASM mine production seems plausible. Exporters processing ASM material account for about 20 % of total cobalt exports (and just under 15 % of copper exports). Since some of these exporters also process LSM production from their own mines, the assumption that only about 20% of their exports come from the ASM sector (and thus about 5% of total exports for cobalt and 1.4% for copper) seems reasonable.

Compared to 2019 and 2018, a continuing decline, especially in cobalt production but also in copper production (depending on the scenario) from ASM has been identified (Table 15). The obvious limiting factors are the relevant reduction of active artisanal mines, more attractive gold prices with simultaneously stagnating cobalt prices, the closure of the Mutoshi ASM project and, to a limited extent (max. two months), the COVID-19 pandemic.

The monthly gold production as a by-product of artisanal copper-cobalt mining was also estimated at about 25 kg.

Table 15. Copper- and cobalt exports from the DR Congo (BCC 2020, Schütte 2021) and division into export shares from LSM and ASM production.

Year	Copper exports [t Inh.]	Cobalt exports [t Inh.]	ASM Cobalt [t Inh.]	LSM Cobalt [t Inh.]	Factors affecting ASM production
2016	1.023.687	68.822	4.673	64.149	lower cobalt prices, relatively unattractive
2017	1.094.638	82.461	17.253*	65.209	Rise in cobalt-prices triggers increase in activities and migration
2018	1.239.059	109.402	26259	83.143	Maximum cobalt prices, short time boom of the ASM sector
2019	1.420.386	77.964	12805*	65.159	drop in cobalt prices & disputes with mining companies affect the production
2020	1.587.459	85.855	2.600 – 4.400*	81.455 – 83.255	Intervention of the army, COVID-19, drop in cobalt prices early Q1 & Q2, Suspension of Mutoshi

* The estimated (*) shares of ASM and resulting LSM shares of cobalt exports are given. The estimated value is always around 15% of the total share (2016 & 2017) or based on the extrapolation of the information obtained from the mine survey (2019 & 2020).

Type of mining

Regarding the type of mining, a distinction is made between open pit and underground mining. The majority of mines, 79 % (42 out of 53), operate underground. The depth of the shafts can reach very far, depending on the rock stability, but maximum depths of the mines worked are unknown. Anecdotal information indicates depths of up to 70 m, but this information cannot be verified. According to mining law, artisanal underground mining is not permitted and pits are only allowed to a depth of 30 metres. Eight other mines operate open-pit mining, three mines mine both open-pit and underground.

With regard to the deposit type, this report does not refer to geological terms, but only distinguishes between primary and 'artificial' deposits. Artificial deposits are old stockpiles from which ores are mined and which have not been processed in a (former) mining project for economic reasons and thus were dumped as stockpiles. Adits and pits that are no longer producing are left open, and the surfaces are not closed or rehabilitated at any of the 50 mines that produce from primary deposits.

Processing and pricing

In order to estimate the degree of beneficiation of the ore mined at the respective mines, the field teams verified the existence of the rather primitive beneficiation steps of crushing, grinding, washing, separating, screening (Figure 16): If the ore was only crushed, ground and washed at a mine, or if only one of these steps was carried out, the ore subsequently sold is classified as raw ore or not beneficiated. In this case, it can be assumed that the concentration due to the washing process is insignificant, although technically it is already a beneficiating procedure.



Figure 16. Processing methods in ASM. At the top left, lighter secondary particles are washed out of the ore in a washing trough. At the top right, ore is washed in a small stream. At the bottom left, ore is screened to remove coarse impurities. At the bottom right, crushed ore is filled into bags for transport.

If either screening or separation has been carried out, the ore is subsequently classified as a pre-concentrate. If both steps have taken place, the corresponding production is classified as concentrate. It should be noted that the classification applied is not the same as a subdivision depending on the metal content. When analysing the grade information, which was mainly provided by the selling miners, no correlation between the degree of processing and the metal grades analysed at the time of sale could be found. Raw ore was sold at a total of 24 mines, pre-concentrate at 14 and concentrate at 14; no information could be given at one mine.

Compared to the BGR survey in 2019, it is noticeable that far fewer mines are concentrating their produced ore. This could be related to the fact that the transport routes for the sellers are less costly than in 2019 and the tonnages therefore do not necessarily have to be reduced by upgrading. However, it was not possible to identify the actual reason for this change. Processing steps other than crushing the delivered ores are rarely carried out at the depot level. The minimum metal content of the purchase of artisanal copper and cobalt ores at depots is 2% for copper and 1% for cobalt.

The quality of the ores at the time of purchase by the depots is verified in 95% (110 out of 116 depots) by so-called portable X-ray fluorescence spectrometers. These directly indicate the metal content of a sample of the delivered bags and, in combination with the weight, decisively determine the prices to be paid out. However, this method can be fraught with uncertainties in methodology and technique, as described above. Only two depots rely on a visual estimate of the ore grade, four other depots carry out further analyses to determine the grade. Miners, cooperatives and civil society often criticise that the spectrometers are manipulated by many buyers, and the same is said of scales. It is quite possible to manipulate the spectrometers vis-à-vis untrained and rather uneducated trading partners without them being able to check or

prove the manipulation themselves. In most cases it is sufficient to carry out the calibration of the spectrometers by incorrectly factorising the calibration curve resulting in lower metal grades. Low metal contents then result in lower prices. A price list for different ore grades is almost always publicly available.

For almost all depots, price determination is related to the international exchange price of copper and cobalt, the metal content and the delivered weight. Most depot operators (111) stated that they regularly adjust local prices to international price changes. The frequency varies from daily (31), to weekly (2), monthly (8) and sporadically or on occasion (70).

9. Economic Aspects of the Artisanal Copper-Cobalt Sector

Income level of artisanal miners

A total of 255 miners were asked about their income situation. Several wage levels were defined to classify the information (Table 16). The two thresholds of the lowest wage level represent the Congolese legal daily minimum wage SMIG and the poverty line (\$3.5 or CDF 7,075, cf. 2019 still \$4.2 by exchange rate, \$1.9 or CDF 3700 for poverty line).

Table 16. Summary table of reported daily incomes of artisanal miners, classified by poverty line, Congolese minimum wage and subsequent 5-dollar increments.

Daily income [CDF]	Daily income [USD]	No of miners 2020 [2019]	% of total	Mean income [2019]	Modal income 2020 [2019]
<3,700 (below line of poverty)	1.9	16 [53]	6.3 [22.1]	28,200 CDF/ 14 \$ [12,950 CDF/ 7.65 \$]	10,000 CDF / 5 \$ [5,000 CDF/ 2 \$]
<7,075 (below minimum wage)	3.5 [4.2]	34 [44]	13.3 [18.3]		
7,075-20,000	3.5 [4.2]-10	85 [68]	33.3 [28.3]		
20,000-30,000	10-15	33 [23]	12.9 [9.6]		
30,000-40,000	15-20	14 [25]	5.5 [10.4]		
40,000-50,000	20-25	19 [5]	7.4 [2.1]		
50,000-60,000	25-30	10 [0]	3.9 [0]		
60,000-70,000	30-35	4 [11]	1.5 [4.6]		
70,000-80,000	35-40	8 [3]	3.1 [1.3]		
80,000-90,000	40-45	1[2]	0.3 [0.8]		
90,000-100,000	45-50	14 [1]	5.5 [0.4]		
>100,000	>50	17 [5]	6.7 [2.1]		
Total		255	100		

* without 17 maximum values

When considering this, it should first be noted that the statements of the sample of 255 miners are not representative for approximately 31,200 miners. Nevertheless, they give an insight into the living conditions of miners in artisanal copper and cobalt mining.

Compared to 2019, the income situation in this group is relatively improved (Table 16). The proportion of miners whose wages are below the poverty line of \$1.9 is also lower in 2020 than in 2019. The average wage, excluding 17 outliers, is \$14, almost seven dollars (almost 100%) higher than in the 2019 comparison group. Even if one were to assume the 2019 exchange rate for minimum wage, the group of those earning below minimum wage would only be marginally larger (59 instead of 50).

Commodity-based wage differentials could only be found at the mines producing gold as a by-product (1240% higher than the average wage). The difference between miners working on cobalt and copper mines was found to be minimal. On average, miners on artisanal mines producing cobalt as their primary product earned 2000 CDF more. Systematic wage differences between men and women were not found and, when asked, were only confirmed at two mines by women working there. However, the number of women in artisanal mining for copper and cobalt is too small to make this a systematic criterion.

The wage differences between 2019 and 2020 cannot be associated with better commodity prices on the world market at the time of the field survey (Figure 2). The copper price was about \$300 higher at the time of the September-October field survey than at the time of the 2019 field survey, whereas the cobalt price was 550 \$ lower in 2019 than in 2020. This could also not explain the price spreads between 2019 and 2020 at depot level (Figure 17 & 18), which for both commodities are more positive in 2020 than in 2019.

Theoretically, this could be due to the imbalance between the number of mines and the number of depots, and thus between the offered mine production and the number of buyers, which forces depots to offer better prices. The lower number of mines compared to 2019 and also the production scenarios of copper and cobalt ores from artisanal mining presented in the previous chapter suggest a tighter supply situation, which could translate into higher prices.

It is interesting to note that in the 2019-2020 annual comparison for copper and cobalt ores, more attractive prices were paid to miners in 2020 for ores with the same metal contents. For this study, all accessible price lists of 2020 depots (copper seven, cobalt eight) were averaged and compared with those of 2019 (copper: seven, cobalt six). Figure 17 shows the resulting annual comparison for copper and cobalt. A respective extract focuses on the "low grades", which are based on the averaged purchased metal grades (3.5% Co and 10.5% Cu). This shows that the prices in 2020 were higher than in 2019. However, due to the very small and unrepresentative amount of data and very high standard deviations (2 sigma at about +/-150%), this statement should be regarded as a hypothesis. A major drawback with regard to comparability between individual depots are the different price scales; some price lists start at, for example, 4% Co content, while others start at 1% and scale their prices in decimal steps of 0.1%. These differences are even more pronounced in the case of copper.

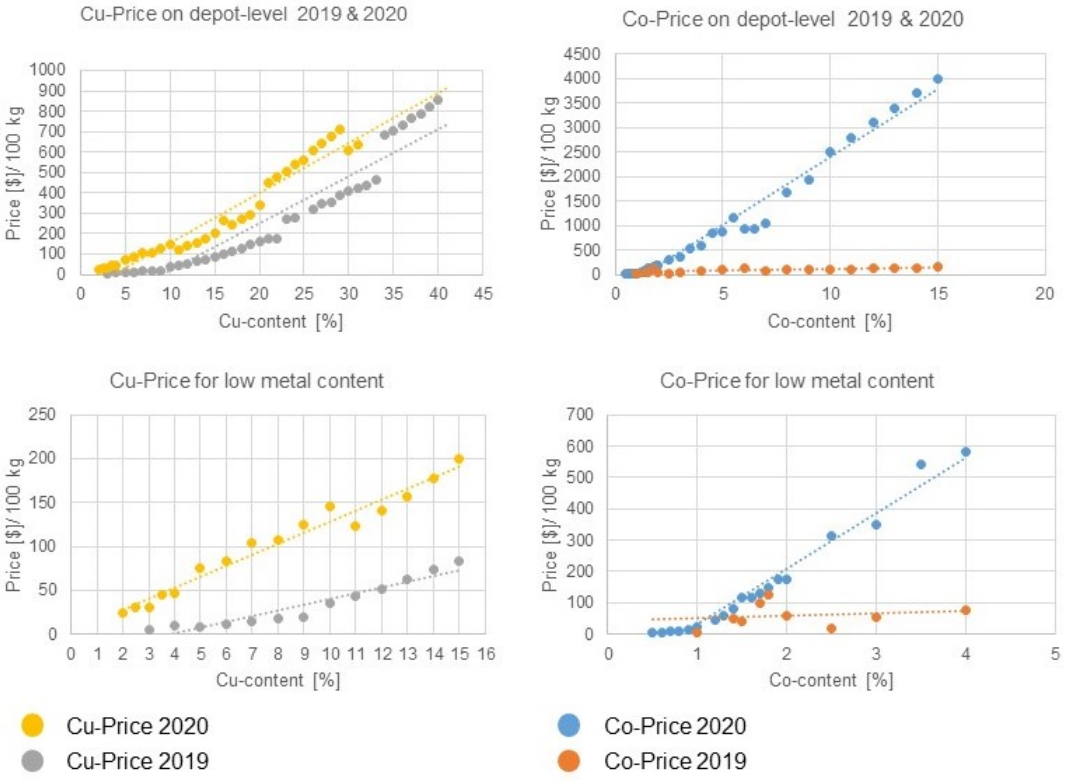


Figure 17. The four graphs plot the average price structures encountered at depot level for the 2019 and 2020 site surveys as a function of metal content (number of depots n for averaging copper prices for both 2019 and 2020: 7; number of depots n for cobalt prices 2019: 6 and 2020: 8). Copper prices are plotted on the left, cobalt prices on the right. For both commodities, it is noticeable that prices are higher in 2020. In order to be able to make a better comparison, in addition to the total interval, the most common metal contents for the respective commodities were also plotted around the determined mean metal contents (below).

The seemingly positive price development for miners, combined with the information provided by miners on their wages, suggests that the income situation for miners is better than in 2019. The amount of data is not sufficient to be considered representative for more than 30,000 miners. Other reasons for the possibly better income situation could be reduced levies imposed by cooperatives and a lower tax burden.



Figure 18. Price lists for the sale of copper and cobalt ores, which are displayed at trading depots. Prices are determined by metal content, and some depots pay bonuses for higher tonnages or increased metal content (right). Some depots accept ores from anywhere (centre).

10. Risk Assessment

Due diligence

Human rights violations and illegal control of mine sites in the Congolese Copperbelt.

Human rights violations cannot be consistently ruled out in artisanal mining for copper and cobalt. The presence of the army and the secret service on mines, but also the involvement of the army in guarding industrial concessions that attract the attention of artisanal miners, however, increase the risks in this regard. Recent press reports also point to the increased risk of human rights violations in the region (Radio Okapi 2021a; Radio Okapi 2021b). Furthermore, the presence of state security forces can be seen as an influencing or controlling factor in commodity supply chains; the burden of proof or clarification lies with the Congolese state. The involvement of the secret service in the issuing of documents for the ore transport is not comprehensible and justification for this activity has not been found in Congolese law.

Irregular and non-centralised or electronic payments to authorities create an increased risk of corruption. The reported and partly denounced practice, especially by depot operators, of authority representatives appearing directly on site to collect fees support the assessment that the common practice of everyday corruption and extortion in the DRC also prevails in artisanal copper and cobalt supply chains. However, the data collected did not give the impression of systematically organised corruption.

Discrimination of women

The low number of women and their statements regarding their widespread exclusion from artisanal mining is due to the low level of education, traditional customs and superstitions of many miners. Women are thus denied one of the few available sources of income. Mining cooperatives and supervising authorities have a responsibility to prevent or at least mitigate such discriminatory practices by raising awareness and educating miners, but it is not known whether this is currently done.

Support of illegal armed groups

As already reported in the past, the two producing provinces of Lualaba and Haut-Katanga are not considered conflict areas, and the risk of support to illegal armed groups or international terrorist organisations is therefore considered low.

Non formalised production and traceability

De jure the legal status of most artisanal mines must still be described as illegal. Due to the extensive toleration of artisanal mining by the license holders, the sector moves rather in a grey zone of informality, though.

The integration of trading depots into the sector's analysis and the attempt to reconstruct the supply chains as far as possible revealed that in large parts of the supply chains there is no continuous and reliable traceability from mine to export. A more reliable documentary traceability seems only to be given starting from the supply chain level "depot" to crude refineries, however, in the course of the field survey, information was often obtained that in some cases false declarations or under-declarations distort the data record regarding the traceability of the preceding stations.

Even if the indication of the mine at the depots was correct and the parties involved in the transaction were identified and authorised to trade, this will not necessarily imply that the mining conditions are known to the buyers (especially in the case of depot trading centres along the national highway) or that a certain minimum standard is applied as a criterion for sourcing raw materials.

The mixing of ores produced under different mining conditions at refinery level increases the complexity of a precise risk assessment. In addition, it is unclear whether the crude cobalt refineries declare the ASM content in their product to their customers and address it in their own due diligence reporting. Furthermore, the information collected at depot level indicates that, in addition to the mines surveyed, a relevant production of artisanal miners from industrial concessions also enters the supply chain. Neither proof of origin nor a minimum level of organisation of artisanal mining were observed in these areas.

Child labour

Child presence or child labour was found on 30% of the surveyed mines (16 out of 53). On two of these mines, approximately 80 children estimated to be under ten years of age were present. These mines were located in close proximity to residential areas and the majority of these children were not involved in mining activities. At the 14 remaining mines, where only children over the estimated age of 10 were found, these children were always involved in mining activities, either in mineral processing or mining underground. The estimated total number of children working in the surveyed part of artisanal copper-cobalt sector was around 250; these activities should be considered as falling under the definition of the worst forms of child labour.

This indicates that the estimated number of children either working or present on mines is lower than in 2019 when approximately 2,500 children were found. This correlates with the observation that more artisanal cobalt mines were located inside or in the immediate vicinity of residential areas in 2019 (Figure 21). Nevertheless, it is still valid to state that worst forms of child labour exist in the DRC's artisanal copper and cobalt mining sector, even if only a very small proportion of their production is incorporated into crude refinery supply chains.



Figure 19. Signs at the entrance to artisanal mines, as shown here, are rather the exception. The signs indicate rules and prohibitions (no children, no pregnant women, no night work, no alcohol).

Responsible mining practice

Occupational health and safety

Working accidents

At the time of the field survey the registered number of accidents in the past twelve months, which is partly based on estimates or anecdotal evidence, is divided into fatal accidents and accidents causing injuries. As on most mines there is no classification of accidents and resulting injuries in a standardised way (Fig. 20), the corresponding classification had to be derived from the stated causes of accidents.

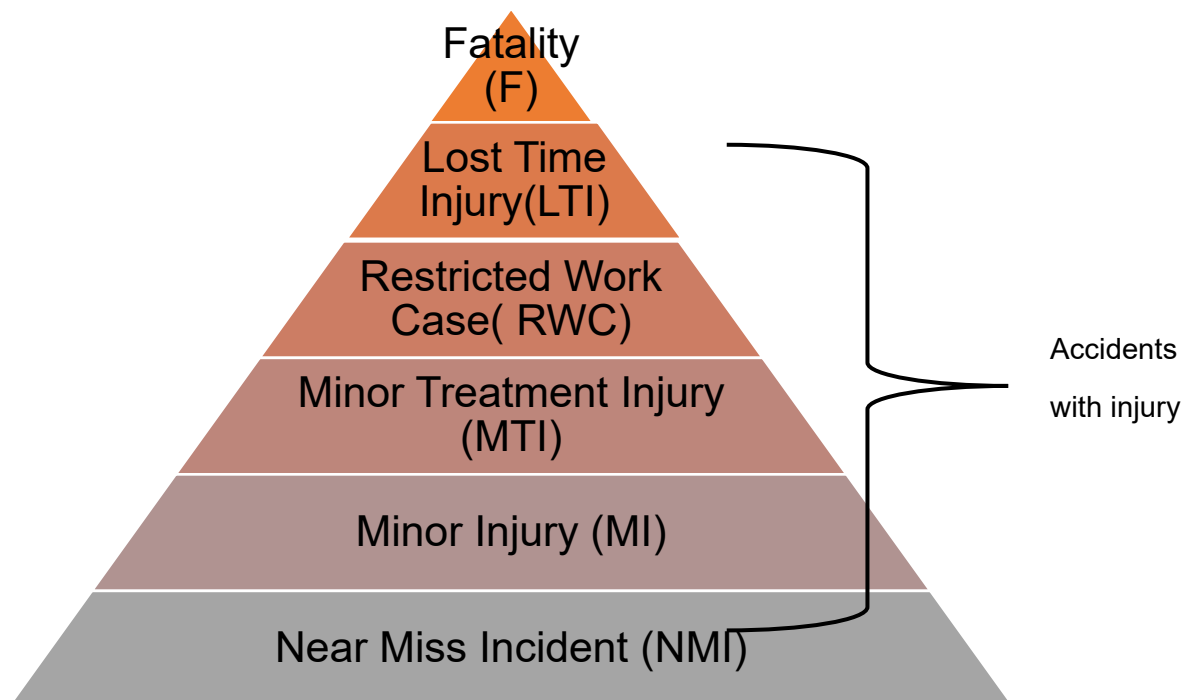


Figure 20. The pyramid shows the classification of incidents and accidents into different classes. These classes give an indication of the impact or consequences of the accident on the working capacity of the person involved (modified from World Steel Association 2019).

A total of 59 fatal accidents were recorded on 19 different mines in the last twelve months. The percentage breakdown of the accident causes can be seen in Table 17. A total of 851 accidents resulting in injuries were reported on 44 mines. The severity of the accidents resulting in injuries is broken down according to the percentages in Table 17.

Table 17 Overview on the types of accidents observed during the field survey and their frequency in conjunction with the accident results.

Accident cause	% fatal accidents	% accidents resulting in injuries
collapse	70	30
fall	5	13
asphyxiation	5	2
land slide	5	7
injury by handling equipment	5	45
burns	0	1
electric shock	0	1
unknown	10	1

A large proportion of the accidents and accident causes can be attributed to working underground (Figure 21). The frequency and severity of accidents at the eight mines that mine exclusively in opencast mining underscores that fact, as not a single fatal accident was recorded here and also only 14 accidents resulted in injuries, mostly due to careless equipment or tool handling. It was not possible to calculate or estimate the frequencies of lost working hours due to accidents, as the necessary quantification of the total working hours per mine is highly inaccurate.



Figure 21. The pictures show rudimentary, partly insufficiently implemented safety measures at the entrances of galleries and shafts. It can be seen that in the rainy season, tarpaulins usually cover the shafts to prevent the ingress of rainwater and destabilisation of the shaft entrance.

Personal protective equipment

Personal protective equipment was provided at only one mine. Otherwise it is not available, not used or not requested by the majority of artisanal miners. The lack of personal protective equipment is usually associated with the subjectively perceived high cost of such equipment and that such investments made by the mining cooperatives are considered too risky by these. The reason being that miners sold on material handed out in the past or did not wear it out of habit and neglected or misused the equipment. Also, many miners are very mobile and might move to another mine or province with the equipment provided.

No cooperative imposes an obligation on its miners to wear protective equipment. The purchase is therefore left to the miners themselves, so that the wearing of personal protective equipment is voluntary and also a question of the miners' personal financial means.

Social impact of artisanal mining

Although the overlap between residential areas and artisanal mining has decreased since 2019, mining, including artisanal mining, nevertheless takes place in close proximity to towns and villages. Many artisanal miners live directly in the town of Kolwezi, for example. Disputes and protests, for example triggered by the evacuation of a mine, differences in price negotiations or work accidents, influence the lives of these communities. However, the extent to which mining cooperatives, intermediaries and depots contribute to local development, for example in the context of community consultations and development plans, is questionable.

As described in the previous chapter, the income situation for miners may have improved. Considering the severity and danger of the work and the value produced, especially in cities with a higher cost of living, these wages do not correspond to an adequate wage. However, compared on a national level, the wages of artisanal miners are still significantly higher than, for example, in agriculture or in the domestic service sector.

Environment

The site survey revealed that in most cases there is no closure of abandoned pits and tunnels, and no systematic tailings, waste or overburden management. In this context, increased radioactivity was also measured at numerous sites. Ores are often washed in natural waters, sometimes not far from residential areas. This usually leads to an input of fine material that impacts on aquatic life and water quality.

As artisanal copper-cobalt miners almost exclusively extract oxide, rather than sulphide ore, the risks for acid mine drainage are low in most cases. Mining or hand-picking from waste dumps that may contain sulphide ores may occur, but no detailed cases were observed. Nevertheless, it is not clear whether, for example, washing the ores results in an increased input of heavy metals into natural waters and soils.

Mine-related dust emissions, especially in the dry season, may include cobalt particles. Several publications point to the toxic effects of cobalt, e.g. on the respiratory tract (Kitenge et al. 2020; Cheyns et al 2014; Putter et al. 2011).

Decent working conditions

In order to assess whether artisanal mining for copper and cobalt is taking place under decent working conditions, the core labour standards of the International Labour Organisation (ILO) were primarily used as a reference and findings assessed against them (Table 18).

Individual criteria, such as equal pay, the right to organise and the right to collective bargaining, could not be reliably assessed within the framework of the study, as much more data would have to be available than was possible here. However, it is clear that most miners do not have any status or policy document that regulates their work in a mine (for a cooperative).

Nevertheless, when considering the other core labour principles as well as other principles that define decent working conditions, it is evident that the current conditions in the sector cannot be classified as dignified. Particularly with regard to child labour, occupational health and safety, discrimination and adequate incomes, the sector suffers from serious abuses.

Table 18: The table lists the ILO core labour principles and additional criteria necessary for the evaluation of decent work..

ILO convention	Core labour conventions / criteria	Evaluation
convention 87	Freedom of Association and Protection of the Right to Organise, (1948)	Grey
convention 98	Right to Organise and Collective Bargaining (1949)	Grey
convention 29	Forced labour (1930) Protocol of 2014 to the Forced Labour Convention (2014)	Green
convention 105	Abolition of Forced Labour (1957)	Green
convention 100	Equal Remuneration Convention (1951)	Grey
convention 111	Discrimination (Employment and Occupation) Convention (1958)	Orange
convention 138	Minimum Age Convention (1973)	Red
convention 182	Worst Forms of Child Labour Convention (1999)	Red
	Fair wages	Orange
	Work place safety	Red
	Social insurance of employees and families	Yellow

* The colour code assesses the conditions encountered in the artisanal mining sector on copper and cobalt against these criteria (grey: not assessable; green: compliant; yellow: partially compliant; orange: inadequate; red: clear violation).



Figure 22. Risk assessment of the artisanal copper-cobalt sector in DR Congo. An attempt was made to compare current assessments with the 2019 assessment through classification and quantification (red 2019; orange 2020). The further the lines extend outwards, the greater the risk. The quantification was not based on a reference, but is in part based on the risk management system from Annex 2 of the OECD guidelines (i.e. risks that lead to the termination of business relationships or the need for risk mitigation). It is evident that some risks, such as the possible illegal control of mines by security forces or the assessment of working conditions, have improved. Most criteria are stagnant in their assessment; the gender aspect was examined more thoroughly in 2020 than in 2019 and was therefore newly included in the assessment.

11. Recommendations

The assessments in the previous chapters indicate that the intra-DRC supply chains for copper and cobalt ores from artisanal mining are complex and partly non-transparent. Compared to the previous year, no positive changes can be observed with regard to the relative share of child labour or the existing risks of occupational health and safety. The legal situation of most artisanal mines already in existence in 2019 also remains unchanged, and newly developed mines can also be categorised as informal (Figure 22).

Existing pilot projects of international NGOs, initiatives and companies have not yet generated a visible positive impact on the sector as a whole. Individual projects have been suspended or are not yet being implemented, which is why a broad impact on the sector as a whole cannot be expected in the short term.

The BGR provided recommendations in its 2019 report that could drive the formalisation of artisanal and small-scale mining and at least address relevant issues. These recommendations from 2019 are summarised below. At the time of reporting, a large part of these recommendations are still valid; relevant progress in this regard can only be noted in parts.

- Establishment of ASM zones to provide stability for the cooperatives and to reduce the potential for conflict between LSM and ASM.
- Creation of a multi-stakeholder committee at provincial level to deal with local mining-related issues (comité provincial de suivi)
- Establishment of expertise requirements for newly accredited mining cooperatives
- Capacity building of mining cooperatives on human rights and occupational health and safety issues
- Capacity building of the SAEMAPE and DiviMines authorities
- Better channelling of mine production at mine level to reduce complexity of supply chains
- Declaration of the ASM share in the cobalt exports of the crude refineries processing artisanal cobalt
- Investigate the environmental impact of artisanal and small-scale mining on copper and cobalt
- Establishment of the necessary legal framework for mine site inspections by government inspectors
- Implement certification systems based on independent evaluations and audits.

Although twelve new ASM zones have been established in the two provinces of Haut-Katanga and Lualaba in 2019 and 2020, only four of these zones are located in roughly connected regions with road access. The attractiveness of these new zones is not necessarily guaranteed, especially since some of these regions have not even been industrially explored for raw materials. Without attractive ASM zones and mining cooperatives supported by industry and civil society partners, it will be difficult to establish responsible artisanal mining and decent income opportunities through it.

The CTC certification system was integrated into Congolese legislation as a legal requirement for artisanal copper and cobalt mining (Ministry of Mines 2020). However, the absence of basic requirements for the initial assessment of artisanal cobalt mines makes implementation difficult in this sector. Another factor slowing down implementation is the lack of a multi-stakeholder steering committee, which, with the support of BGR, would be responsible for implementing CTC. BGR recommends that the Ministry of Mines establish this committee.

In addition to the renewal of the 2019 recommendations, the following recommendations are made that may contribute to the sector's formalisation and improve risk management in the supply chain:

- The state-owned company EGC, which has a monopoly on the purchase of ASM cobalt, does not currently have the financial means and the technically necessary processing capacities to purchase the entire cobalt production and to ensure responsible artisanal mining on a broad scale. The extent to which the establishment of EGC supply chains will have a positive impact on copper production from artisanal mining is not apparent. Article 8 of the Ministerial Decree on the Establishment of EGC (Ministry of Mines 2019) allows delegation or entering into local partnerships with other companies. This would allow other ASM buyers to be approved, which could bring in processing capacity and capital and thus relieve EGC of responsibility.
- The state-owned mining company Gecamines is considered a key player due to the fact that a large part of the artisanal mines are located on its concessions. Entering into partnerships to lease the land could sufficiently formalise some mines that also meet certain governance criteria. This would allow international projects and initiatives to support government capacity building measures and regular, transparent monitoring. This monitoring or inspections could help to guarantee decent working conditions for artisanal miners and at the same time assure international buyers that minimum standards are being met.
- Harmonisation and transparent reporting of levies and taxes payable at mine and depot level by state authorities is considered necessary. Transparent levy and tax collection, unaccompanied by additional attempts of extortion by individual state representatives, would also encourage the actors involved in the supply chain to work more transparently themselves. Under-declaration of tonnages or re-declaration of the origin of ASM production could thus be reduced. Reliable financial inspections and plausibility checks are necessary in this context. Moving away from the practice of cash payments of levies towards a completely electronic system in cooperation with trusted banks may accompany this development.
- In this context, the DRC office of the Extractive Industries Transparency Initiative (EITI) may investigate the financial flows of the artisanal sector and include at least the cobalt trading depots as reporting actors in its annual reporting. The materiality threshold for companies at sub-national level was set at \$20,000 in the last EITI report; it is likely that a large proportion of trading depots (at least the "top 20 depot owners") have a turnover above this threshold.
- With regard to the large number of levies to be paid, it is recommended to raise awareness of the rights and obligations of the involved actors at the depot and mine level.
- The reliability of documentary traceability by Congolese authorities should be strengthened; electronic tracking systems could help here. This should start at the mine level and continue at least as far as the local crude refinery. However, the financial burden of such systems should not be borne solely by the upstream actors in the supply chain. Care should also be taken to ensure that any tracking systems fully harmonise with Congolese law and the already established documentary traceability system. The responsibility for implementing such systems should also be established with strong Congolese participation.
- An in-depth analysis of copper and cobalt trading depot ownership and the registry of intermediaries could be made possible through more detailed research, e.g., by cross-checking data from the commercial registry and the registry of the Ministry of Mines. Understanding the actors involved in the copper and cobalt supply chain is a key element for taking action on due diligence and risk analysis.

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